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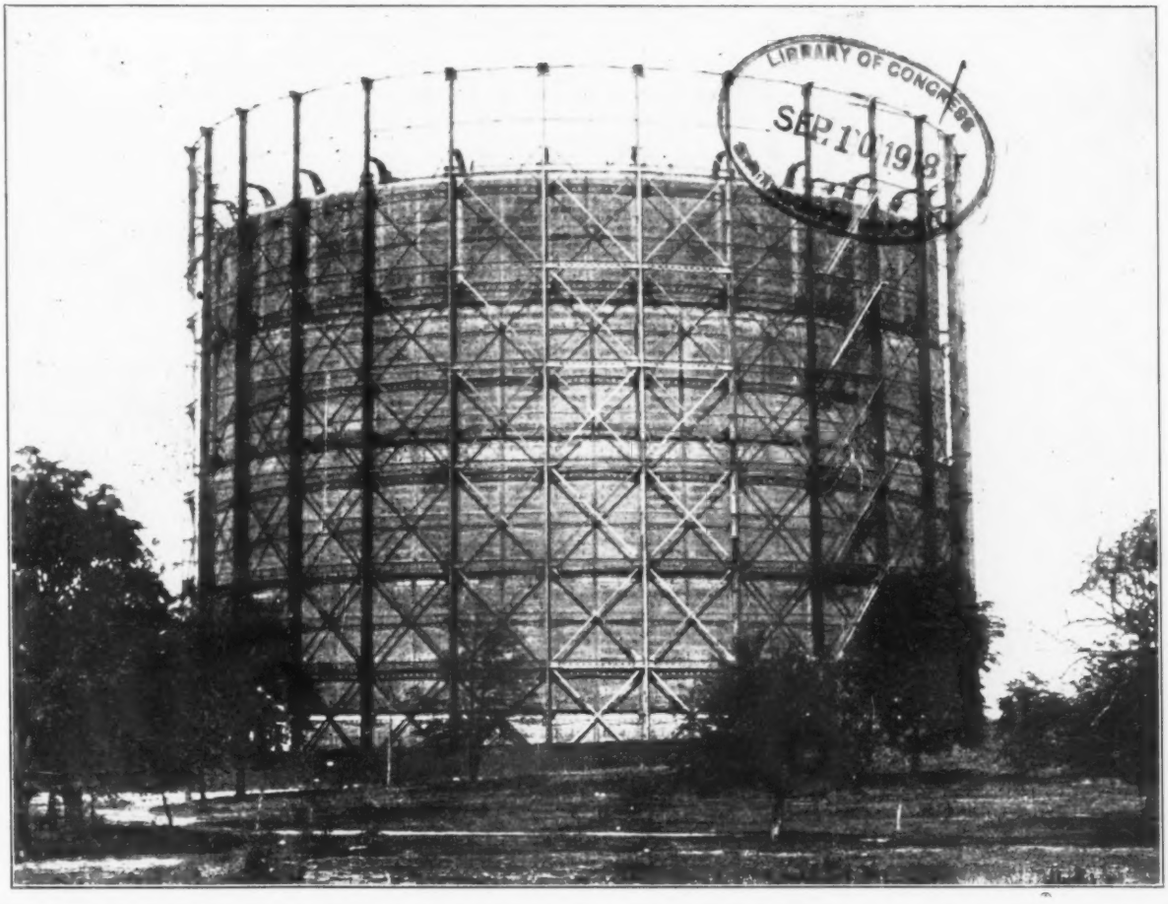

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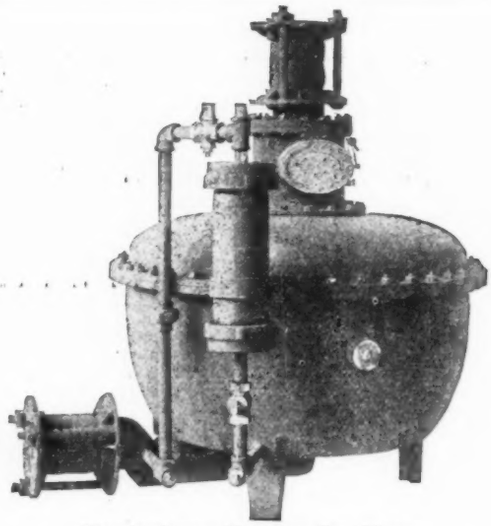
INDEX TO CONTENTS, PAGE 228 ADVERTISERS' INDEX, PAGE 20



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The Gas-Appliance Testing Laboratory—Part IX

An Even Guess that Larger Part of House Heating in Not Distant Future Will Be Accomplished By Gaseous Fuel—Who Will Figure the Radiation Necessary?

By H. M. RILEY and L. B. WILSON, Jr.

At the least, it would seem to be an even guess in assuming that the larger part of house heating in the not distant future will be accomplished by gaseous instead of solid fuel.

It might be argued against the above statement that the price of gas has probably reached its lowest point, and will, as time goes on, pursue an upward trend, thereby making the disparity of costs between it and coal greater. On the other hand, there are certain influences which will tend to offset any normal increase in the price of gas for house heating, and among these we might list:

1. Growing tendency on the part of the people to demand homes with a minimum of unnecessary space, thereby requiring smaller quantities of heat.

2. Strong likelihood that the price and quality of coal will not lower or increase to any great extent once we are again enjoying peace times.

However, it is not the intention of this article to discuss the probable extent of house heating by gas, but rather to impress upon the reader that this phase of gas utilization is an actuality and, accordingly, demands that more than passing attention be given to the matter of testing and passing upon the many heating appliances that are proposed for sale by the gas companies to their customers.

As an argument supporting the extra carefulness to be exercised by the laboratory in testing gas house-heating equipment (and we refer particularly to central heating plants housed in the cellar), let us assume that a hot-air furnace has been tested more or less haphazardly and the information sent to the commercial department. Finally, the furnace is installed at a particular address, and upon the development of an extra cold snap it fails to meet the demand for keeping the home at 70 deg. Fahr., or whatever the temperature desired might be. To illustrate further, it might not make so much difference if a fixture is rated as giving 100 candle-power and only actually develops 90 or 92 candle-power. That is to say, as a general proposition, the customer would not make any serious complaint. The same might also be said of a hot-water supply from a gas water heater where the rated temperature might be 7 or 8 deg. higher than that actually developed. But it would make a difference if during a severe drop in the temperature a gas-fired heating furnace operated at an efficiency 5 per cent less than its rating in this direction was supposed to be.

The Laboratory as a Guarantee of Adequacy

We not only consider it essential that the furnace's rating be closely established by the laboratory, but also feel that the ability to figure the amount of radiation required by a particular house should be mastered. In most companies the work having to do with estimating the radiating surface needed in a given house is handled by the commercial department, the salesman, who interviews the prospective customer, taking the necessary measurements and data and making the subsequent calculations involved. Still other companies handle this work through the medium of the laboratory men. This latter method is perhaps somewhat preferable, since it centralizes all the technical work involved under one head and allows the men who are most familiar with the characteristics and peculiarities of the furnace to match these attributes against the peculiarities of the construction of the house. At the same time it makes for a minimizing of installation errors that are bound to crop out from time to time. At all events, the laboratory should have at hand and be able to apply properly trustworthy data on radiation and heating.

On page 14 of "Hubbard's Heating and Ventilation" will be found a table which has been found very accurate in figuring the amount of radiation required for a given house.

Naturally, the use of such basic data requires at times certain adjustments and minor corrections based chiefly on common sense and experience.

To What Extent Does Previous Coal-Fired Installation Govern Performance of Gas-Fired System?

This brings us to a very important point for consideration, namely, to what extent does the previously installed coal-fired heating system govern the future performance of the gas-fired system which it is to supplant? To be explicit, let us assume that the salesman is about to close an order for a gas-fired heating installation, say, a hot-

water furnace for example. Say, also, that he has counted the radiator sections, together with their dimensions, which data he proceeds to convert into terms of heat units, and subsequently into the size of furnace and gas consumption needed. He is then in a position to quote costs and the other accompanying information. Here at once opens up an avenue for an error of considerable magnitude to enter in. This is so if we suppose that the coal-fired system radiators were not originally adequate in capacity to take care of the heating in cold weather, and we consequently have merely repeated the mistake.

In other words, then, the salesman has based his gas-fired furnace's capacity on insufficient radiating surface, and hence given it a "black eye," so to speak. Obviously, this chance for error can be nullified by not only taking into account the radiating surface, but also measuring the wall and window area and the miscellaneous attendant data.

We do not consider it amiss that the laboratory men should know how to conduct a test on a coal-fired house-heating system, both in the laboratory and actually on the premises. A brief outline for such a test is given below.

Test of Coal-Fired System (See Fig. 27)
System—Hot Water

For the sake of simplicity, we have taken a furnace supplying one radiator only. Installed in the return hot-water line to the furnace will be noted a water meter of the hot-water type, which should be sufficiently large so as not to greatly interfere with the normal rate of return of water. This obviously measures the quantity of water heated in a given time by the furnace. A pitot tube might also be used, but it is not considered quite so satisfactory for this purpose as the meter.

The preliminary portion of the test is run by firing the furnace and allowing the temperature of the room A, B, C, D to reach 70 deg. Fahr., whereupon the height of the coal in the furnace is carefully noted. Then from a weighed stock of coal the fuel is replenished from time to time, as required, account being taken of the amounts by weight. At regular intervals the water meter's statement is taken, and in addition the inlet and outlet water temperatures of the furnace, the inlet and outlet water temperature of the radiator, flue temperature and temperature outside of the room.

The room temperature should be kept as near 70 deg. Fahr. as possible by means of a device such as the Minneapolis or other reliable heat regulator, and the duration of the test should not be less than twelve hours, in order that any discrepancy in the amount of coal remaining unconsumed might be minimized.

Several samples of flue gas should be analyzed, and an analysis and B.t.u. determination should be made of the coal used. As a numerical example, let us assume the following data:

Coal Analysis

Water	1.4 per cent
Carbon	83.0 per cent
Hydrogen	4.5 per cent
Oxygen	0.5 per cent
Nitrogen	0.6 per cent
Ash	10.0 per cent

Coal charged during test, 25 lb.
B.t.u. value of coal, 14,000 per pound.
Carbon in ash, 2.0 per cent.

Flue Gas Analysis

$CO_2 = 5.0$ per cent
$O_2 = 15.5$ per cent
$CO = 0.4$ per cent

Temperature flue gases, 360 deg. Fahr. (T_F).

Temperature air in cellar, 60 deg. Fahr.

Average temperature water from furnace, 160 deg. Fahr (F_O).

Average temperature water to furnace, 95 deg. Fahr. (F_I).

Average temperature water to radiator, 152 deg. Fahr. (R_I).

Average temperature water from radiator, 115 deg. Fahr. (R_O).

Water meter registration, 35.0 cu. ft.

Calculation of Flue Products

Let X = total ash (normal ash + unconsumed carbon).

$X - 0.10 \times 25 =$ unconsumed carbon.

Then $X - 0.10 \times 25 = 0.02\ X$.

$X = 2.55$ total ash.

$2.55 - 2.50 = 0.05$ lb. unconsumed carbon.

Carbon in coal $= 0.83 \times 25 = 20.75$ lb.

Hence $20.75 - 0.05 = 20.7$ lb. carbon burned.

Let a = cubic feet of dry flue gas.

Then $0.05\ a$ = cubic feet CO_2.

$0.004\ a$ — cubic feet CO.

$$\frac{0.05\ a \times 1.857 \times 0.12}{16 \times 44} = 0.00158\ a \text{ lb. C in } CO_2.$$

$$\frac{0.004\ a \times 1.195 \times 12}{16 \times 28} = 0.00013\ a \text{ lb. C in CO.}$$

$0.00158\ a + 0.00013\ a = 20.7$.

$0.00171\ a = 20.7$.

a = 12,105 cu. ft. dry flue gas.

Water Vapor in Flue Gases

From moisture:

$0.014 \times 25 = 0.350$ lb.

$$\frac{0.350 \times 16}{0.764} = 7.4, \text{ or say } 7 \text{ cu. ft.}$$

From hydrogen:

$25 \times 0.045 = 1.125$ lb. H_2.

$$\frac{1.125 \times 16}{0.085} = 212 \text{ cu. ft. } H_2.$$

And 212 cu. ft. H_2 yield 212 cu. ft. water vapor.
Hence total H_2O vapor = 219 cu. ft.

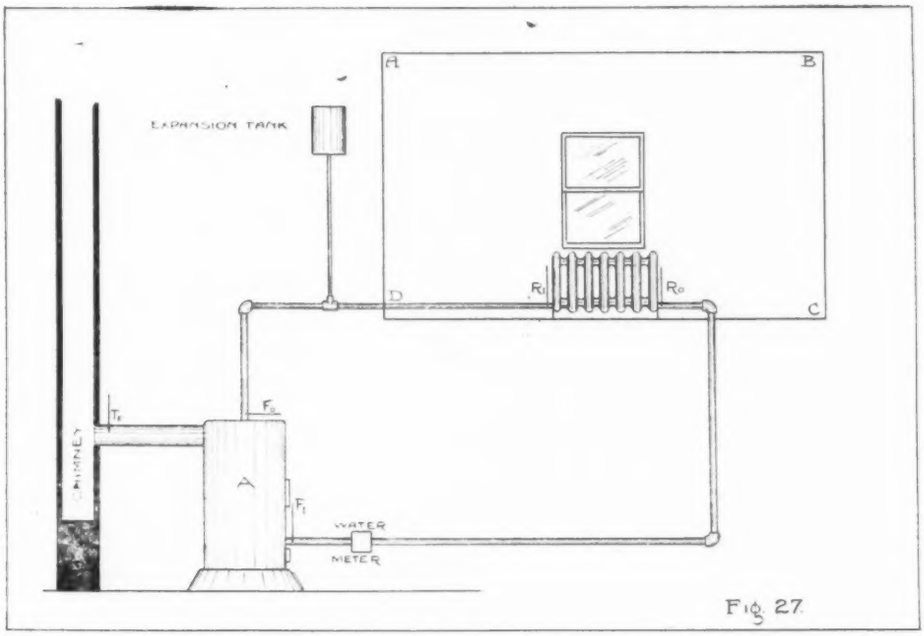

Fig. 27

Nitrogen and Oxygen Flue Gases

12,105 × 0.05 = 605 cu. ft. CO_2 } at 60 deg. Fahr.
12,105 × 0.004 = 48 cu. ft. CO } and 30.00 in.

605 × 0.116 = 70.2 lb. CO_2.

48 × 0.075 = 3.6 lb. CO.

$$70.2 \times \frac{12}{44} = 19.2 \text{ lb. C burnt to } CO_2.$$

$$3.6 \times \frac{12}{28} = 1.5 \text{ lb. C burnt to CO.}$$

Now it requires 152.6 cu. ft. of air to burn 1 lb. of C to CO_2 and 71.3 cu. ft. of air to burn 1 lb. of C to CO. (The above at 32 deg. Fahr. and 30.00 in. Barom.)

19.2 × 142.6 = 2,737.9 cu. ft. of air to burn C to CO_2
1.5 × 71.3 = 106.7 cu. ft. of air to burn C to CO

2,844.8 cu ft. of air to burn 20.7 lb. of carbon.

At 60 deg. Fahr. and 30.00 in. Barom. it will require 3,007 cu. ft. of air.

Air to Burn Hydrogen

25 × 0.045 = 1.125 lb. H_2 in coal.

427.8 × 1⅛ = 0.481 cu. ft. of air needed to burn H_2 a 6 32 deg. Fahr. and 30.00 in., or about 510 cu. ft. at 60 deg. Fahr. and 30.00 in. Barom.

Hence the total air needed may be listed·

3,007 cu. ft. to burn carbon
510 cu. ft. to burn hydrogen

3,517 cu. ft to burn total.

However, we find the coal to contain 25 × 0.005 = 0.125 lb. of O_2, which is equivalent to

$$\frac{0.125}{0.232} = 0.54 \text{ lb. air.}$$

0.54 lb. of air at 60 deg. Fahr. and 30.00 in. equals about 7 cu. ft.

Hence 3,517 − 7 = 3,510 cu. ft. of air required.

3,510 cu. ft. of air contain 737 cu. ft. of O_2 and 2,773 cu. ft. of N_2.

Now the 15 per cent of O_2 in the flue gases must be due to

$$\frac{12,105 \times 15}{0.21} = 8,647 \text{ cu. ft. of excess air.}$$

Summation – Oxygen

12,105 × 0.15 = 1,816 cu. ft. from excess air.

Nitrogen

8,647 − 1,816 = 6,831 cu. ft. from excess air

$$\frac{25 \times 0.006 \times 16}{1.185} = 2 \text{ cu. ft. from coal}$$

3,510 × 0.79 = 2,773 cu. ft. air to burn C and H_2

9,606 cu. ft. total N_2

Oxygen	1,816 cu. ft.
Nitrogen	9,606 cu. ft.
CO_2	605 cu. ft.
CO	48 cu. ft.
Total	12,075 cu. ft. dry flue gas

In addition, there are 219 cu. ft. of water vapor.

Distribution of Heat Items

Heat expended:

25 lb. × 14,000 B.t.u./lb. = 350,000 B.t.u. in coal as fired.

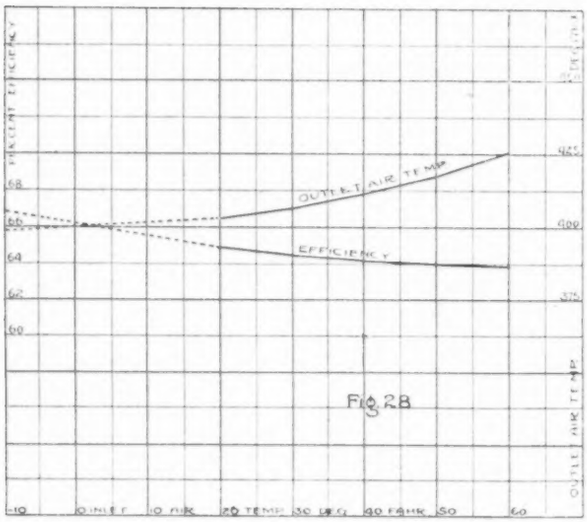

FIG. 28

Efficiency at furnace:

35.0 × 62.5 × 65 deg. rise = 142,188 B.t.u. useful heat imparted at furnace.

$$\frac{142{,}188 \times 100 \text{ per cent}}{350{,}000} = 40.6 \text{ per cent efficiency at furnace.}$$

Efficiency at radiator:

35 × 62.5 × 37 deg. rise = 80,938 B.t.u. useful heat given out by radiator.

$$\frac{80{,}938 \times 100 \text{ per cent}}{350{,}000} = 23.1 \text{ per cent efficiency at radiator.}$$

Heat lost by water en route to radiator:

$$35 \times 62.5 \times (160 - 152) = 17{,}500 \text{ B.t.u.}$$

$$\frac{17{,}500 \times 100 \text{ per cent}}{350{,}000} = 5 \text{ per cent.}$$

Heat lost by water from radiator to furnace:

$$35 \times 62.5 \times (115 - 95) = 43{,}750 \text{ B.t.u.}$$

$$\frac{43{,}750 \times 100 \text{ per cent}}{350{,}000} = 12.5 \text{ per cent}$$

Heat Escaping via Flue

Sensible Heat in Flue Gas

O^2, N^2, CO—

$$11{,}470\ [0.0189 + 0.0000009\ (360 - 60)]\ (360 - 60) = 66{,}096 \text{ B.t.u.}$$

CO^2—

$$605\ [0.023 + 0.000008\ (360 - 60)]\ (360 - 60) = 4{,}538 \text{ B.t.u.}$$

H^2O—

$$219\ [0.021 + 0.000005\ (360 - 60)]\ (360 - 60) = 1{,}544 \text{ B.t.u.}$$

Total 72,178 B.t.u.

Pounds of Water Vapor in Flue Gas

1 cu. ft. water vapor at 60 deg. Fahr. and 30.00 in. Barom. weighs 0.0478 lb.

$$219 \times 0.0478 = 10.47 \text{ lb.}$$

Latent Heat of Vaporization

$$10.47 \times 965.1 = 10{,}104 \text{ B.t.u.}$$

Heat in 1 lb. of water from 60 to 212 deg. = 151.92.

$$151.92 \times 10.47 = 1{,}591 \text{ B.t.u.}$$

Heat of Combustion of CO in Flue Gas

$$48 \text{ cu. ft.} \times 324 \text{ B.t.u./cu. ft.} = 15{,}552 \text{ B.t.u.}$$

Total Heat in Flue Gas

66,096 B.t.u. sensible heat in O^2, N^2 and CO.
4,538 B.t.u. sensible heat in CO^2.
1,544 B.t.u. sensible heat in H^2O vapor.
10,104 B.t.u. latent heat in water.
1,591 B.t.u. sensible heat in liquid water.
15,552 B.t.u. heat of combustion of CO.

99,425 B.t.u. total.

$$\frac{99{,}425 \times 100 \text{ per cent}}{350{,}000} = 28.4 \text{ per cent}$$

Heat represented in unconsumed carbon in ash:

0.05 lb. carbon × 14,544 B.t.u. = 727 B.t.u.

Radiation and unaccounted for losses:

350,000 — (142,188 + 99,425 + 727) = 107,660 B.t.u. = 30.8 per cent.

It must be understood that the above assumed data is entirely fictitious, and should not be accepted as representing the performance of a furnace under actual working conditions. The calculations have been carried out with the thought that the same might be of some help to the laboratory man, inasmuch as similar problems of an industrial nature might be encountered from time to time. For a very complete treatise on the subject of testing coal-fired house-heating furnaces and radiators, the reader is referred to Carpenter's book on heating and ventilation. The writers would particularly emphasize the point of determining the percentage of carbon in the ash, since in some cases this will run rather high, and if not taken into account will cause the radiation and other losses to seem abnormally high.

Testing Hot Air Gas-Fired Furnaces

Under this heading will fall two classes of furnaces:

1. Those depending on natural draft for the passage of the air to be heated through the furnace.

2. Those employing some motive power to force the air through the furnace.

It is quite essential in testing the hot-air furnace that one keep in mind the fact that in some coses furnaces are installed on the consumers' premises with the air intake fed from the cellar atmosphere, whereas in a fully equal number of cases the air to be heated is drawn directly from the outside of the cellar.

Naturally, in the case where the air is drawn from the cellar, the temperature of the same will be more or less constant, and at the outside will not vary more than 20 or so degrees, say, from 50 to 70 deg. Fahr. However, where the air is drawn from the outside, its temperature will vary exceedingly, depending, of course, on the climatic conditions of the particular locality. This at once raises the question as to what should be the proper inlet-air temperature when testing this style of heating furnace. Accordingly, if it is not deemed

necessary to exhaustively test the furnace, it is recommended that the inlet temperature of the air be kept at or about the lowest temperature most likely to be encountered. This would be a rather difficult thing to do, particularly in summer, and hence such a class of furnace should be preferably tested during the coldest months in winter. By so testing at the lowest inlet-air temperature, we are at least safe in estimating on the furnace's heating capacity. It would seem that the best plan would be to expend a little more time and test the furnace's efficiency for different degrees of inlet temperature. Then by plotting a curve based on inlet temperature and efficiency a very complete record would be at hand for the sales department. The varying of the inlet temperature could easily be accomplished by placing an auxiliary burner under the duct leading from the outside to the inlet of the furnace. Say, for example, that a certain hot-air furnace was tested with the outside air temperature at 20 deg. Fahr. The scheme then would be to ascertain the efficiency with the entering air at 20 deg. Fahr., next at 30, and so on, by 10 deg. increments, up to, say, 60 deg. Fahr. As an illustration of the curve to be plotted, we have shown by Fig. 28 just how the data is to be worked out (the data and curve are assumed). The dotted lines on the curve are approximations of the data to be derived if the minimum temperature were zero and the furnace had been tested on such a day when this temperature obtained. Hence, allowing for a small error, it would not be necessary to wait indefinitely for a day that might have a minimum temperature in order to determine just how the furnace would perform.

It is at once obvious to the reader that the most important thing to ascertain, when determining the efficiency of a hot-air furnace, is the volume of air drawn through the same in a given interval of time. Concerning the finding of this figure, the reader is referred to the Oct. 30, 1916, issue of the *American Gas Light Journal*, which contains a complete description of the scheme employed, together with some other data and calculations.

By the method described, one is enabled to find the amount of heat that can be delivered to each and every register in the house; that is, after making some heat loss corrections for each unit of distance traveled by the hot air.

In measuring the temperature of the inlet air to the furnace, the laboratory man should be careful that the thermometer does not hang so close to the furnace as to be affected by the radiant heat from its surface. Otherwise, an efficiency result would be obtained which would be too low. It will be noted in the article referred to that the use of either the ordinary city gas or else pure CO_2 gas as an indicator for determining the amount of air drawn through the furnace is recommended. However, an equally good substitute is the flue gas itself, which can be drawn into a small holder and fed into the inlet-air opening or wherever desired.

In the case of those furnaces where forced draft or circulation is employed, it is also advisable that the efficiency and other data be determined for not only various inlet temperatures, but for various speeds of the draft producer as well. The subsequent plotting of a curve based on this data is also suggested. It might be mentioned in passing that a good hot-air (natural draft) gas-fired furnace will run about 65 per cent thermally efficient, and one with forced draft from 5 to 10 per cent higher.

In testing the hot-air furnaces, readings and data should be taken for a period of at least an hour after the outlet-air temperature has about reached a constant point. Air temperatures should be taken at intervals not longer than five minutes. The flue temperature of the products of combustion should also be read at the same interval. It is also considered well to take similar data during the heating-up period, for the same will be found of much use later on. Such data as gas meter reading, room temperature, etc., can be taken at longer intervals than that specified above. The method for finding the volume of air drawn through the furnace per unit of time should be carried out not less than twice during the test.

Testing Hot-Water Gas-Fired Furnaces

The gas-fired hot-water furnace is closely akin in its operation to the circulating gas-water heater, with the exception that the former is on a very much larger scale. Accordingly, the testing of the same is carried out on quite similar lines; that is to say, water is passed through the furnace, which has been previously lighted, and its quantity by weight, its rise in temperature, flue temperature, gas consumption, etc., are recorded. In general, then, the reader is referred to the Jan. 5, 1918, issue of this publication for more detailed information concerning the testing procedure and the attendant calculations. There is a very important point, however, that must be carefully looked into, and which has to do with the rate at which the water is passed through the furnace, as well as its inlet temperature. We very well know that in actual working on the customer's premises the inlet and outlet water temperatures, as well as its rate of flow, vary quite considerably, and this variation is chiefly governed by the temperature of the outside atmosphere. For example, we might have a very cold day, with the water leaving the furnace at, say, 185 deg. Fahr. and returning at 100 deg. Fahr. On the other hand, on a day not so cold the water might be leaving and returning to the furnace at 150 deg. Fahr and 125 deg. Fahr. respectively. One of the variables, the rate of flow of water, can be eliminated as an item of test, since the outlet and inlet temperatures take care of this feature. That is, if we could ascertain the inlet temperature for each and every outlet temperature, all that would be necessary to conduct the test would be to heat the water by means of some auxiliary heater to a certain temperature, and then pass this heated water through the furnace at such a rate that its outlet temperature would be at the desired point. This could be done for different sets of inlet and outlet temperatures, and a curve plotted for efficiency and other data.

It is very likely that this method of testing the hot-water furnace is not made use of by any laboratory in this country, most of them depending on the scheme which provides for running water through the furnace, say at tap-water temperature for the inlet and adjusting the outlet temperature to 120 deg. Fahr. by varying the rate of flow. It is thought, however, that the first suggested method is not carrying the proposition to "hair-splitting" extremes. The problem then seems to be to compile dependable data as regards various sets of inlet and outlet water temperatures through the

medium of experiments, calculations, etc., after which the testing routine becomes a quite simple matter.

Testing Gas-Fired Steam Furnaces

For the most part, steam boilers when used or heating homes are not operated at very high pressures. Indeed in the very coldest weather a gauge pressure of 3 or 4 lb. is seldom exceeded, and for average weather only a few ounces pressure is carried. The quality of the steam produced is very moist, and even in the milder periods of the heating season the return condensation to the furnace is comparatively low in temperature. Here, too, as in the case of the hot-water heater, where accuracy is sought, it would be well to do some experimental work along the line of determining the various return condensation temperatures and the accompanying steam pressures. It is also essential that some means such as a calorimeter be provided for ascertaining the amount of moisture in the steam, which in turn will render the subsequent calculations more nearly correct.

Since the steam pressures are so comparatively low, it is preferable that a mercury-filled U-gauge be used in place of the ordinary gauge for reading the pressure.

Two methods may be employed in testing the steam boiler:

1. All steam generated being allowed to escape to the atmosphere, the water being replenished at regular intervals.

2. The steam generated being passed through radiating coils and returned to the boiler in the form of condensation.

The first method of test is the one most generally used, and is probably not very accurate for the reason that water at faucet temperature is used in replenishing the water passing out of the boiler as steam. It can be easily seen that where accuracy is desired, the water supplied to the boiler should be in a heated state, for this is the condition that prevails in practice.

The second method is by far the most accurate and is practically just as easy to run as the first. However, this scheme requires that some means for measuring the rate of steam generation be provided. This can best be taken care of by being sure that all the steam returning to the boiler is in the form of condensation, and then installing a hot-water meter in the return line close to the boiler. One is then enabled to read directly the cubic feet of condensation flowing back to the boiler in a given time. Of course, a hot-water meter is fairly expensive, but can be found useful in other testing work from time to time.

In conducting a test on a gas-fired steam boiler, data should not be taken until the desired steam pressure is attained and remains more or less constant. Observations should then be recorded for a period of not less than an hour.

Since the procedure is much the same as in the case of a coal-fired steam boiler, the reader is referred to Kent's handbook for specific details.

Testing Miscellaneous Heating Plants

In recent years attempts have been made to develop and perfect some system for heating buildings and houses by gas whereby each and every room to be heated would be more or less independent of the heating of the other rooms. That is to say, each room would be thermostatically controlled, and in a sense would have its own individual heating plant. One such system employing radiators, each individually fired by gas, and in turn the products of combustion being drawn away through piping by an electrically driven exhauster, has been placed on the market and has had a fair amount of sales. This system, which has for its active principle the maintaining of a vacuum or rather negative pressure in each radiator, is truly ingenious and, provided certain mechanical and physical defects are overcome, bids fair to enjoy a successful commercial life. When passing upon such a system, the laboratory man should weigh carefully the merits, stability, etc., of the mechanical parts, just as in the case of the automatic water heater. He should inquire carefully into the likelihood of the pilots becoming extinguished, and also the effect of condensation on the exhaust piping. In time the acid nature of the moist products of combustion will gradually, but nevertheless surely, corrode iron or steel pipe to such an extent that a leak will occur, whereupon the radiators will not operate. Then will follow an expensive delay in having pipes taken from between partitions and floors for replacement. A remedy for this hazard would be to install lead piping, or else iron piping with the inside coated with a thin layer of lead.

In the thermal test on a radiator of such a system it would be well to determine the heat given out by the radiator as well as the amount given out by the length of piping from the radiator to the ceiling. The temperature on top of the radiator should be noted, for if the same is too high there is a likelihood of a fire being started, as well as small children being badly burned. Of course this latter point suggests the advisability of covering each radiator with a protection of some kind.

Miscellaneous

There are several hot-water gas-fired furnaces on the market whose efficiencies are so high (over 85 per cent) that the temperature of the products of combustion are well under 212 deg. Fahr., thereby causing nearly all the H_2O products of combustion more or less combined with the sulphurous products, to condense out and deposit in the take-off flue pipe. This gives rise to rapid corrosion of the flue pipe, and, indeed, in some cases the condensation drips down over the coils of the furnace itself, with more or less serious corrosion as a result. To offset this condition two remedies suggest themselves:

1. To so decrease the efficiency of the furnace by change in design that the flue products leave the furnace considerably above 212 deg. Fahr.

2. To install either a terra cotta flue pipe or else one coated with some substantial asphaltum paint.

If the first suggestion is followed out, a still further troublesome difficulty arises, namely, the liability of the sulphurous condensation attacking the mortar between the chimney bricks, causing in turn discoloration of the plaster and any wall paper that might be located next to the chimney. This effect of condensation would, of course, not be present in the case of those chimneys which are lined with tile.

The deterioration of mortar, etc., is no theory, but actually a fact. This phenomenon can be easily tested out by obtaining some condensate, and at regular intervals, say four times a day for a month or more, it

can be heated to about 180 deg. Fahr. and poured over several brick joints. Also an analysis of the mortar can be made before and after deterioration sets in and comparisons drawn therefrom.

Another item which is worth while testing out has to do with the installation of an automatic water heater, and the consequent running of the flue pipe into the main flue pipe from the gas-fired furnace. Experiments should be run in order to determine the proper location, angle of entrance, etc., of the respective flue pipes in order that there will be no interference with the draft in either case once the installation is made. Also, as explained in the seventh installment of this series, check drafts should be given a thorough testing, and if any moving or swinging parts are employed, they should be subjected to a condensation test in order to find out whether rapid corrosion takes place with the subsequent failure of the moving parts to act properly.

In conclusion, the laboratory man should familiarize himself with the theoretical and practical operation of the various heating systems, and should also be posted to a certain extent on the proper methods of making the installation. As a matter of fact, much depends on the manner in which the fitting work, etc., is done, whether or not a heating furnace works up to its highest efficiency. Many times the failure of a furnace to act properly is directly chargeable to an improper installation, and if the laboratory man can readily detect such cases he will be in a very good position to advise intelligently concerning future installations.

No Part of Funds Used in Montreal Pension Plan Obtained from Employees

Plan Has Already Had 8-Year Try-Out—Some Pensions Back on Company's Active Payrolls and Some in Other Businesses Without Forfeiting Pensions

In the early part of 1910 our company felt that a time had arrived when some provision should be made for officers and permanent employees who, after long years of faithful service, had reached an age when they were unequal to the further performance of their duties, declared C. S. Bagg, secretary-treasurer of the Montreal Light, Heat & Power Company, in a paper presented at the recent annual convention of the Canadian Gas Association. With this object in view the directors, with the approval of the shareholders, determined upon a plan of superannuation.

The system adopted calls for no contribution from the employees themselves, the fund being contributed entirely by the company. By thus voluntarily establishing a system under which a continued income is assured to those who after years of service are, on account of age or infirmity, no longer fitted to perform their duties, and without which they might be left entirely without means of support, the company aims to build up among the employees a feeling of permanency in their employment and a desire to remain in and devote their best efforts to the company's service.

The rules and regulations under which the pension fund is operated are as follows:

Rules and Regulations

The pension fund shall, subject as hereinafter mentioned, be administered by a pension committee whose members shall from time to time be nominated by and hold office during the pleasure of the board.

The pension committee will be constituted by the executive of the company, to wit: President, vice-president, secretary-treasurer. "Ex-officio" the president shall be chairman and the secretary-treasurer secretary of the committee.

All actions and decisions of the pension committee shall from time to time be reported to the board for confirmation, and when confirmed shall (subject to such modifications, if any, as may be made by the board) take effect as from the date of the decision of the pension committee.

Subject as aforesaid and as hereinafter expressed, the pension committee shall have power:

To make and enforce rules and regulations for the efficient operation of the pension department;

To determine the eligibility of employees to receive pension allowances;

To fix the amount of such allowances; and

To prescribe the conditions under which such allowances may be granted;

And they may, for the government of their own proceedings, make rules not inconsistent with these regulations.

The benefits of the pension system will apply to those persons only who are now or hereafter may be in the service of the company and who have been required to give their entire time and attention to the business of the company or of the company and some controlled company jointly. In cases of such joint employment the pension committee shall decide the amount of the employees' pay to be taken into account in determining the pension allowance.

Sixty-five Retiring Age

It is intended that in future all officers and employees shall be retired on reaching the age of sixty-five years. The pension committee may, however, retain any officer or employee in the service of the company for any further period. Provided, however, that no employee who has reached the age of sixty-five years without having served fifteen years' continuously in the company's service shall be eligible for pension allowance.

The pension committee shall have power under special circumstances to retire an employee prior to his reaching the age limited by Article 6. Any employee after the age of sixty, with not less than twenty years' continuous service, claiming to be unfitted by reason of permanent physical or mental disability from following his usual or any other suitable employment in the company's service, shall be retired if the company's chief medical officer shall certify to such disability as aforesaid.

Any employee after ten years' continuous service, who shall become incapable of continuing his service by reason of injuries accidentally received while actually at work in the employment of the company, shall, so long as his incapacity continues, in the opinion of the company's chief medical officer, be eligible for pensions or allowances as hereinafter expressed.

Retirement shall be made effective from the first days of January or July in each year.

The term "in the service" shall refer to employment upon or in connection with any other "subsidiary com-

pany" operated by the company, and the service of any employee shall be considered as continuous from the date since which he has been continuously employed in such subsidiary company, whether prior or subsequent to their control or acquisition by the Montreal Light, Heat & Power Company.

An employee retiring under rule 6, provided he shall have been not less than fifteen years in the company's service, and an employee retiring under rule 7, or entitled under rule 8, may be granted an annual pension or allowance calculated at the rate of 1 per cent for each year of service on average annual wages or remuneration during ten years immediately preceding retirement.

Example: An employee has been in the service for ten years and received on an average for the last ten years $600 per annum, the pension allowance would be 40 per cent of $600, or $240 per annum.

Those Who Sue Company Debarred from Pension Rights

No employee who sues the company for damages on account of personal injuries sustained by him in the course of his service will have any claim for pension or allowance under these rules.

When pension allowances are authorized they shall be paid monthly during the life of the beneficiary, provided, however, that the company may cancel any pension in case of gross misconduct on the part of the pensioner, or of any action on his part inimical to the interests of the company.

Pensions will be payable monthly in arrear at the company's office.

Absence on leave, suspension or discharge, followed by reinstatement within three months, or temporary layoff on account of reduction of force when unattended by other employment, will not be considered as a break of continuity of service.

Employees going on strike or ceasing from work when their services are required, thereby become ineligible for pension allowance.

No pension or allowance shall be assignable, and in the event and during the continuance of any seizure, attachment or garnishment will cease to be paid.

Keeping Track of Beneficiaries

The secretary of the pension committee shall keep himself informed of the whereabouts of all employees who have been retired from service, and shall require satisfactory evidence from each of such employees at least once a year that he still comes within the rules and regulations. The proportion of unpaid pensions of deceased employees shall be paid up to and including date of death as the pension committee shall decide.

The acceptance of a pension allowance does not debar a retired employee from engaging in other business, but such retiring employee cannot so engage in other business nor re-enter the service of the company, except with the consent of the pension committee, without forfeiting his pension allowance.

It is not intended in future to appoint to the permanent staff of the company any person above the age of forty-five years.

It is expressly provided that neither by establishing out of its revenues a system of pensions by the company, nor by any other action now or hereafter taken by them or by the pension committee, shall it be construed as giving to any official, agent or employee of the company a right to be retained in the service or any legal right or claim to have any pension whatsoever, and the company expressly reserves its right and privilege to discharge at any time such official, agent or employee when the interests of the company in its judgment may so require, without liability for any claim for pension or other allowance than salary or wages due or unpaid.

Back to Work and Still Receiving Pension

These rules and regulations shall take effect July 1, 1910, and may be altered or repealed from time to time as the committee, subject to the approval of the board, may hereafter determine.

For the establishment of this pension fund the sum of $10,000 has been appropriated annually; last year, however, it was found advisable to increase the amount, and, accordingly, authorization was obtained and the annual appropriation brought up to $20,000. It is the object to continue these annual appropriations until the fund has reached $225,000, when it is estimated the income from the fund will then suffice to provide for any call that may be made upon it. In the meantime the pay of our pensioners is charged against operating expenses.

In closing I wish to say that several of our pensioners have accepted positions with other employers and we have also re-engaged a few at their special request; in such cases they receive the scale of pay in keeping with their new work in addition to the pension allowance.

Victor V. Starzenski, assistant general manager of the Schenectady (N. Y.) Illuminating company and the Mohawk Gas Company, has been commissioned as first lieutenant in the chemical warfare service of the army. He left recently for the Edgewood Arsenal, Baltimore. His work there will deal mostly with the manufacture of gasses for use in France. Mr. Starzenski is a member of the National Commercial Gas Association, American Gas Institute and for two years had served as a member of the standardization committee of physical test of the American Gas Institute. He is a member of the National Electric Light Association and chairman of the manufacturing committee of the Empire State Gas and Electric Association.

H. C. Deffenbaugh, for the last year and a half assistant to the secretary of the Empire State Gas and Electric Association, New York City, has been commissioned first lieutenant, Corps of Engineers, United States Army, and assigned to the Searchlight Section, 56th Engineers, Washington Barracks, Washington, D. C.

Harry Walters Hough has been commissioned a captain in the Engineers Reserve Corps, and has been called to Washington for assignment. He was born in Baltimore, Md., and received his early training through connection with the Consolidated Electric Light & Power Company.

Glen M. Ruby, formerly of the department of geology of the Bartlesville (Okla.) Gas & Oil Company, has been admitted to the Officers' Training Camp at Camp Taylor, Ky.

Responsibility for Adequate Extensions of Gas Company Plants Up to the Regulatory Commissions

Walton Clark Declares That Lack of Ability to Secure Capital Is Greatest Danger to Gas Company's Ability to Properly Serve Public Under Commission Regulation

There are conveniences, comforts and protections of urban life possible to combined effort, impossible to individual effort, stated Walton Clark, in an address before the Public Utility Law Section of the American Bar Association at Cleveland. Such of these as confer benefits impossible of accurate measurement and of apportionment of cost in proportion to benefits received, or as are of equal benefit to each citizen—each citizen's proper use being of immediate interest to all citizens because of the direct influence on the general health and order, such conveniences, comforts and protections are ordinarily at the general expense and paid for in taxes. Such are police and fire protection, sewage facilities and the administration of justice. Other such conveniences, comforts and protections, impossible of individual provision, conferring benefits that are susceptible of accurate apportionment of cost, and utilized by the citizen if and when he will, and in quantity as he desires, and as are substantially without the factor of general benefit from individual use, are ordinarily provided at a price per unit of service rendered. Such are the gas supply, the electricity supply and the street car service.

There is no question of the importance of each of these agencies of civilization or of the duty of government to secure their benefits to the citizen. On this point, Mr. Walter L. Fisher, recently Secretary of the Interior, closes his essay, "The American Municipality," with these words: "What must be recognizezd is that the city cannot escape its primary obligation so to develop and control its public utilities, whether in public or in private hands, that they shall be effective instruments for the service of the individual citizen and the the development of the organized community."

The development and control of public utilities being a function of the State, and the State having power to delegate its functions, this function of development and control may be performed directly by the State or by such delegate, whether company, municipality, commission or other, as the State may select or create for the purpose.

Since Mr. Fisher wrote his essay in 1906, the legislatures of the majority of the states of the Union have delegated this duty and authority to so-called public utility commissions. The power of decision in matters of price of gas, quality of gas, character of service, raising of capital, issuance of securities, etc., so far as theretofore a function of gas companies generally, has been taken from them and lodged in State commissions. With this shift in power from company to commission necessarily has occurred a corresponding shift in responsibilty.

Only Industry Which Shows at End of a Generation a Lower Selling Price of Its Product

Such State created commissions are now in existence in about forty States and territories. The group of States having commissions charged with full or with some lesser measure of control of gas companies, and with responsibility for the protection and extension of the gas industry, now includes all of the large States and contains about 80 per cent of the total population of the Union. Therefore, the condition which Mr. Fisher declares to be an unescapable municipal obligation to secure, must now be secured through the action or with the consent of a State public utilities commission in most of the States of the Union.

It is profitless to discuss the necessity to the public good for the formation of State commissions to develop and regulate gas companies, as it is to study the cause of the public agitation resulting in commission legislation. Commissions are a fact, and the gas industry generally will admit that where operated with intelligent good intent they will afford a solution of the difficulties ever existent where a corporation has a monopoly of the supply of a necessity. We of the gas industry do this without abatement of our claim that in the past we have properly ordered our affairs and have been in the best sense public servants. Our past is our convincing witness.

We gas men, by our experiments, by our searching of the laws of nature, by our canvassing, by our insistence and persistence in getting consumers to use appliances that would be useful to them and save them money, have so extended the sale and reduced the cost of gas, while greatly improving the quality, that we have been enabled to reduce the price per unit to 40 per cent or less of what it was a generation ago. This is truly public service, and to the result there is no parallel in the history of industry. We are no factor in the high cost of living. In the algebraic sum that represents the increase in the cost of living, we are a negative quantity. In no other line of industry will you find such a history, such a record. And I say it seriously, confidently and with pride. And it has come through conscientious work and the adventurous investment of enormous sums of stockholders' money. We do not assert an altruistic motive, but we believe that our accomplishment to the public good justifies our claim that we are in the best sense public servants.

The business of the manufacture and supply of illuminating gas is about one century old. From the beginning it has been an important factor in community life.

This importance has enormously increased during the last quarter of a century. To-day, no factor more important enters into the life of the urban population—except, perhaps, such as have to do directly with the health and peace of the community—and on these a well ordered street lighting system has a highly beneficial influence.

Heat Value an Index of Progress

In the earlier years of the industry's life the use of gas was almost exclusively for the production of light. "Candle-power" was its most important quality. The industry's development has been coincident with that enormous extension of knowledge of physical science which has marked the last century. It has kept pace in growth and development toward scientific perfection with the general industrial movement of the century. And this development has brought gas very largely into fields of usefulness where its heating power is its most valuable characteristic. It has become, decade by decade, more important to the prosperity of communities. Since the beginning of this century, and mainly through the convenience and cheapness of gas as a heating agent, the industry has increased in importance as a social factor in measure greater probably than has any other industry. This largely has come through the introduction of gas for cooking and water heating to city kitchens, and particularly to the kitchens of people whose related women folk do the family cooking. A little thought will convince you that the 360,000 gas-equipped kitchens now in the city in which I am writing most represent the release of a host of women from a large measure of the drudgery of their lives. But unless you have had definite information on the subject you probably do not realize how great is the saving of time and labor. Careful observation justifies the statement that the use of gas for cooking and water heating saves an average of about one hour a day of the time of one woman or girl cook in each of 360,000 homes. One hour a day release from the duties of fire building, coal carrying, ash removing and the consequent cleaning of vessels, implements and surroundings, and one hour per cook per day is over eighty years of twelve-hour days—eighty years of twelve-hour days of woman's disagreeable labor saved each day in one city by the use of gas-heated domestic appliances. Statesmen and economists must recognize this as certainly a factor of the highest importance, and as marking the continuance and extension of the industry as essential to the maintenance and development of the best condition of urban life. And in this time of stress, with need in war work for every available hour and unit of energy, this eighty years of woman's hard and disagreeable labor economized per day in one city is an enormously valuable asset to the nation.

With the war the gas industry has become the principal source of some of the most important raw materials of explosives. About 30 per cent of the hydrocarbon bases of the explosives now being used by us and our allies are coming from gas manufacturing plants. Thus in war the industry contributes one of the necessities of the nation's protection, as at all times it supplies one of the comforts of modern domestic urban life. These two uses for gas with their beneficent influence on women's lives and on the security of the nation, and with the economy of the material resources of the nation which are incident to them, so clearly mark gas service as one of the necessities of modern life that I regard them as proving the claim expressed by Mr. Fisher that its development and control is one of the primary obligations of government. I feel it is not necessary to dwell upon the importance of gas as an illuminant in millions of homes and on thousands of miles of highways, and its wide and growing use as a labor and material economizing source of heat in scores of industries—many of them industries essential to the conduct of modern warfare.

This relation of the gas industry to the public good has come to full recognition in this country only within the last quarter of a century. The importance to the public welfare of insuring its efficiency and prosperity, and these at the lowest possible cost to the user of gas, is now no longer a matter of debate. The realization of this importance to the public welfare has found most recent expression in the formation of State commissions—whose functions we are now considering.

Regulation in England

The political history of the gas industry shows that from its earliest days the general effort of governmental bodies has been to secure the establishment and maintenance of the industry—however unwise and ungenerous has sometimes been governmental treatment of gas suppliers of apparent prosperity. The gas industry's political history is the story of governmental effort, first, to establish; next, to regulate by unelastic provisions and competition, and finally, through commissions or so-called "sliding-scale" agreements, intelligently to develop and regulate the business of gas supply.

The history of this governmental effort must be of interest to the student of public utilities in their relation to government and to people.

About the beginning of the nineteenth century certain philosophers and experimenters in Great Britain and France were brought by their studies and experiments to believe that it was possible to manufacture and to distribute to the inhabitants of cities a source of light and heat that would be always ready for use, require no storage on the premises of the user, be measured as used, and leave no ashes or other undesirable evidence of its presence and use. Some few men of financial means were among the believers. The realization of this belief, which Napoleon characterized as "Une grande folie," and Walter Scott called the "Dream of a madman," came with the introduction of illuminating gas to London under a charter granted in 1812 in the name of George III, King of Great Britain.

While a few dreamers had had faith, the public had scoffed. Parliament, when finally brought to realize how great might be the importance to the community of such a service as the dreamers prophesied, was liberal in the terms given to the speculative investors. The charter granted the "Gas Light and Coke Company"—the first gas charter ever granted anywhere—imposed no restrictions except that the extent of the experiment, and therefore of the possible loss, was limited by limiting the amount of capital permitted to be raised. In the fixing of the price and quality and of conditions of supply the company was left to the exercise of its own judgment and will. Regulation was impracticable from any point of view. Nobody knew, or could know, what

it would cost to make gas, what the quality of the gas would be, nor even in what terms of comparison the quality would be expressed. Nor was it known what measure of competition the gas supply would find in candles and whale oil—the illuminant of that time. It was seen that a gas supply as forecast would be highly useful, and it was known that it would have to commend itself in price and quality in order to make head against other sources of nocturnal illumination.

The Inducement to Investors

Also, it was known that great latitude must be allowed investors in an enterprise generally prophesied to be doomed to failure. Such investors must have the expectation of unusual profit if their enterprise prove serviceable to the public, to balance against the certainty of total loss if the general expectation of failure were realized.

The corporation was given power to experiment with quality and price. Whatever course seemed to offer the fairest prospect of profit it was free to pursue. In view of the undeveloped state of the art involved, no other course could be expected to secure the establishment of the industry. No other course would give investors such hope of financial reward as to induce them to the precarious investment.

Briefly, the government purpose was the establishment of gas service if it were physically and commercially possible. It was a wise purpose, and they went the right way about it.

The earlier years of the enterprise were lean years, indeed. Apparatus was experimental and inadequate. There were no meters. The gas company sold gas at first by contract at a price per burner, called a "gas rental." The ease with which the supplier could be cheated invited cheating, and the quarrels over bills that arose from the lack of certain means of measuring the service rendered made the gas business of those years an irritation, certainly, to all concerned, and probably a demoralization as well.

With the First Dividend Came the Scramble to Get In

But in 1817 a small dividend was earned, and the success of the theretofore experimental enterprise appeared assured. Doubtless the adventurous men who had provided the funds for the enterprise expected in peace to reap the financial reward for their sagacity, as probably already they were reaping in the respect of their fellow citizens a reward for their courageous public spirit. But trouble was brewing for them. Their success bred a desire in others, less courageous, to share the profits of the industry, at that time believed to be prospectively enormous.

The Parliament then perceived that the corporation, which had been invested with the right to occupy the sub-soil of the streets, was enjoying therein what was and would continue a de facto monopoly as long as no further parliamentary action was had and would likely prove highly successful in its business.

The importance of protecting the gas user from the results of wasteful management and inordinate profits was emphasized by a class of investors who sought to share in the profits of an industry they had not had the courage to initiate.

The benefits to flow to all interests, state, citizen and investor, from creating the gas industry a regulated monopoly and its capital a safe and profitable investment, were not realized or were ignored.

The Parliament, being not less susceptible, perhaps, than are Parliaments of our own time to the ever-fearsome cry of blindness to the people's interest, hastened to give evidence of its interest in the quickest and most obvious way.

Competition the Obvious Remedy for Monopolistic Evils

The obvious remedy for monopolistic evils being competition in kind, and the danger of unregulated monopoly being emphasized, without intelligent suggestion of the merit of established regulations, competition in kind was established. Competition ran its full course in London. Ten years after the formation of the first gas company there were four companies supplying that part of the city lying north of the Thames. Later there were thirteen gas companies with mains in the streets of London. In many streets there were three lines, and in some streets four lines of rival mains. This competition failed of its purpose. Rates were higher in London and service was poorer than in provincial cities, where the industry was a monopoly. Dividends, when existent at all, were small. Finally the nuisance to the public became intolerable, and in 1860 the Metropolis Gas Act, permitting a districting of the territory, was passed, and competition ended. This was soon followed by gradual amalgamation of the thirteen companies—mainly into two great corporations—one operating north of the Thames and one south of the Thames. From the date of the last amalgamation the political history of the London gas industry is the story of effort to encourage investment in gas shares (for extensions and improvements), and to maintain the least possible selling price for gas consistent therewith. This has been secured in London through the operation of the "sliding scale" and "auction clauses" established by acts of Parliament.

I am not given enough time to discuss the various governmental experiments prior to the adoption of the sliding scale principle of control, nor to enter far into the detail of the operation of this admirable device. Briefly, the first purpose of the sliding scale was to encourage investment in the business at the lowest obtainable rates by taking advantage of the competition of the entire unemployed capital of the nation, while stimulating this competition by offering the stock issued for new capital at auction. The second purpose was to enlist the self-interest of owners of gas shares in the effort to reduce rates for gas by providing that the dividends permitted to be distributed—if earned—should vary inversely as the selling price for gas was varied. This plan secured money for improvements at the lowest possible rates, and because of the security of the investment these have been very low. It protected the investor, and resulted in almost unbelievably low prices for gas. This for forty years. The war has temporarily unhinged the scheme, because the great increase in the cost of labor and materials compelled a cost and a selling price at which no dividends are possible under the sliding scale provisions. If the price per ton of gas coal (less credit for residuals) and the price

(*Continued on page 229*)

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CONTENTS

THE GAS APPLIANCE TESTING LABORATORY—PART IX. By H. M. RILEY AND L. B. WILSON, JR. 217

NO PART OF FUNDS USED IN MONTREAL PENSION PLAN OBTAINED FROM EMPLOYEES..... 223

RESPONSIBILITY FOR ADEQUATE EXTENSIONS OF GAS COMPANY PLANTS UP TO THE REGULATORY COMMISSIONS..... 225

EDITORIALS 228

NEWS OF THE GAS INDUSTRY..... 236

PERSONAL NOTES..... 239

CONSTRUCTION NOTES..... 239

The Stiff Upper Lip

With the end of the war in sight, the gas companies of the country face their most severe test.

More soldiers mean more toluol, more fuel for the industries, greater demands from the military forces for service. And all these must be met with diminished and depleted staffs, with little relaxation as to oil and coal anxieties, and, in many cases, without relief in rates.

But the gas companies are going to come through the test with flying colors. Difficulties mean little to them; they have been wrestling with such conditions for months. All that is needed is a stiff upper lip, and this is a quality of which the gas companies have not been found wanting.

There undoubtedly will be hundreds of personal sorrows throughout the gas field. But this will not distract the minds of its personnel from their given task.

It will continue to do its own work ably and amply as it has in the past, and in addition it will sell Government securities, spread the gospel of victory at any price and do whatever else it can find to do to assist those other human beings into whose hands the task has been given to guide the nation through this the greatest crisis in its history.

Coddling Ourselves in Our House Heating

The Fuel Administration has had so many restrictions to make that it is not surprising it has not gotten down to restricting us in the amount of coddling we may indulge ourselves in the matter of house-heating.

We have in mind a civil engineer who kind fates had permitted to find work in one city for a period of fifteen years. Then the inevitable happened. He was compelled to begin roaming, as do so many of his fellows.

His new habitat was up in the Berkshires. It was an open-country job, distant from the nearest town. His family consisted of a wife and infant son.

He found a farmer with a small two-family house—eight rooms. It was a typical farmhouse—no bath, no running water, no central heating system. He could have afforded better, but it was not to be had near to his work.

He made arrangements with the farmer's family to do all the housekeeping, yet leave him the privacy of his side of the house.

The winter that followed was characterized by long stretches of more than ten below zero weather. The only heat he had was from a 12-in. diameter parlor stove in one of the first-floor rooms. The farmer's family got all their heat from the kitchen range. Five tons covered the whole fuel consump-

tion in that house for the winter. Yet no one suffered discomfort or material inconvenience. No one's health was injured, not even that of the infant child. And the windows were not kept always closed at that.

There were readjustments in domestic arrangements, of course. There being no direct heat upstairs, the bedrooms, until the windows had been shut to let them warm up, were not altogether comfortable to dress in. The parlor, where the stove was, though unconventional, maybe, but private, served quite frequently as a dressing room.

This engineer has a ten-room exposed house now. He has eight tons of coal in the cellar. But he is not worried about the winter's prospects. In fact, he rather hopes the rest of his coal order will not be delivered, on account of the cost.

He and his family are going to be warm this winter, though not coddled. He does not intend to keep every room at a sitting temperature. He is going to save on lights and coal.

Reasonable intelligence and a fair restriction on coddling will go a long ways towards solving the coal problem. And when the general public learns how easy such economies are, there is apt to be a big demand for auxiliary gas heaters.

Curtailment in the Manufacture of Gas Appliances

The War Industries Board, we understand, is discussing a curtailment in the manufacture of gas-using appliances. Whatever its decision, it will be cheerfully accepted and rigorously applied.

The AMERICAN GAS ENGINEERING JOURNAL is convinced, however, that the Government body will exercise the unusually careful degree of caution that is an absolute essential in dealing with a problem involving so many opportunities for disastrous errors of judgment as does this.

Appliance ordering in the gas industry is largely a matter of judgment. A company, with what to it seems good reason, may order a thousand gas ranges to meet a year's demand, and find itself, instead, stocked up with them for years to come. This, of course, represents an error of judgment, and the consequences are half a thousand or more gas ranges made under stress of war conditions, using up tons of precious materials only to gather dust in the gas companies' warehouses.

On the other hand, there was the action of the New York gas companies, a year ago last spring, in stocking up to overflowing with gas space heaters—another question of judgment. But the judgment in this case was right, and because of it lives undoubtedly were saved and thousands undoubtedly spared sufferings and privations that to even the strongest wills might have engendered war weariness.

Who is to pass on the soundness of the judgment of these experienced gas men? Who is to take upon himself the fearful responsibility of delivering over to freezing, perhaps—not only through lack of gas-fired heaters, but because of lack of coal that might have been saved but for a dearth of gas cooking stoves, gas mantle lamps, etc.—thousands of human beings, some robust and capable of withstanding it, others not?

These are grave times, and grave decisions must be made. Mistakes are inevitable, and must be borne with fortitude.

It is neither to be expected nor to be desired that the businesses of makers of gas-using appliances be shown any more favor than the businesses of other manufacturers, even than the businesses of makers of essentially pleasure automobiles. But the uses to which the apparatus is put should be carefully considered, and the users.

The joy-rider who for his own selfish pleasure burns up gasoline, now trebly precious, that wears out roads that should be spared for war transportation, is not at all on the same plane as the gas-range user or particularly the gas-space-heater user who, consciously or unconsciously, is paying a premium to spare the nation's coal pile.

Responsibility for Adequate Extensions of Gas Company Plants Up to Regulatory Commissions

(Continued from page 227)

per hour for common labor had been made factors in the formula for controlling the price, as might easily have been and as has been provided in part by an act of the Australian Federal Parliament, the sliding scale would have continued to do justice to public and corporation in this time of war, as during the last forty-odd years of comparative peace.

All British gas companies not operating under the sliding scale have to go to Parliament for power to raise new capital, and therefore at irregular intervals come under governmental investigation and regulation.

This is briefly and broadly the political history of the gas industry in Great Britain insofar as that history has to do with the regulation and protection of gas companies and the encouragement of extension of gas service. It is not necessary to my purpose to discuss the tendency to municipal purchases of gas undertakings, which was quite pronounced about twenty-five years ago, but has had little force for many years.

THIS COUNTRY IN MAIN ESCAPED EVILS OF COMPETITION

America, in the main, escaped the evils of competition in gas supply in the earlier years of the industry, but this was not through intelligent governmental efforts at regulation and protection, and it was at the cost of

all the ills that come with the exercise of an unregulated de jure monopoly. Indifference on the part of the servants of the monopolistic corporation, neglect of effort to reduce cost of service so long as dividends were earned on the part of the owners—irritation born of suspicion of all this on the part of the buyer, and, worst of all, suspicion, and angry, unreasoning charges of dishonest metering—of these is unregulated monopoly the fruitful mother. It is to the credit of the men who controlled the American gas industry through the monopolistic days that there was little justification for charges of indifference and inefficiency—as there never was any justification for charges of dishonest metering.

American cities found it generally necessary to the first enlistment of capital in the local establishment of the industry to grant monopolistic rights for a limited period. Rarely, there was a quality provision in these early franchises. As these franchises expired they were renewed, but generally without the monopolistic feature and generally with unelastic regulatory clauses of varying character included. The owners had necessarily to take practically what renewal terms were offered them, and some were taken with great misgiving. But the great growth in population of American cities—and the greater growth in the sales of gas—mainly due to the intelligent persistence of gas companies to develop its use as fuel, has enabled these companies to maintain a measure of prosperity through a period of rising costs and of generally lowering income per unit of product.

About the year 1880, the so-called Lowe Water Gas Process for making a superior quality of gas from anthracite coal or coke, and the then otherwise valueless distillates of petroleum was invented and became the ground for the formation of many companies in competition with others already in the field. These competing companies have all been combined with their one-time competitors. There was, at the time, a wastage of capital through the formation of these competing companies, but by the increase in use of gas, since realized, the apparatus, mains, etc., of the combined companies have become necessary to the service.

The above brief and rough sketch of the history of the gas industry shows, I think, that as a factor in the development of home comfort and street safety it has had some pretty crude treatment. Yet the gas companies generally have been able to earn dividends and the citizens have had good service. It has been a growing business, and, like a growing boy, has been able to survive the diseases and spankings of infancy and childhood.

The industry, and the company and governmental effort to make the industry "an effective instrument for the service of the individual citizen," have now a perspective. We may see the good accomplished—the mistakes made.

Too Late to Prevent Evils Consequent Upon Early Mistakes

It is too late to prevent the ills consequent upon the early mistakes, but most of these mistakes have run their course and no longer hinder progress. We may learn somewhat from them. The effort of governing bodies, as directed toward gas undertakings, though often blundering, and sometimes vengeful, has generally had the right purpose—the purpose to secure and to continue, first, gas service; second, low-priced gas service, and finally, high-grade gas service at as low cost to the user as possible. Through such encouragement as has been given the industry, it has been sought to secure a measure of relief, of easement of the labors of the people. More comfort, less labor, in the home and in the shop. More safety on the streets at night. More money on hand after bills have been paid. Wiser treatment would have resulted in more accomplishment. But the purpose at all periods, though not in all individual cases, has been the advancement of the general good. The methods too often have been harsh; almost uniformly, in this country, they have been rigid. But now we have in commission control an elastic medium, uniting the corporation and the public interest, and from such control we may, and do, expect continued development of the great industry and the best practicable service to the public at the lowest possible cost—long strides toward reaching the good established by Mr. Fisher's pronouncement.

What must be done to insure the realization of this expectation—to insure that gas companies shall be and continue such "effective instruments" as Mr. Fisher defines—is our problem insofar as we have to do with public utility commissions, or with the operation of gas properties. Our answer has to do first with the provision of plant.

An adequate generating plant and a system of street mains that reaches the dwelling of every citizen within the limits of Mr. Fisher's "organized community" who desires gas service and is able and willing to pay the cost of rendering it to him, are essential parts of an "effective instrument for the service of the individual citizen" and "for the development of the community."

Importance of Capital

Since the first step toward effective gas service is the provision of a suitable and adequate plant, and since capital is necessary to such provision, gas companies must have means of raising capital as needed for extensions and improvements, or they will not be able to perform the functions which Mr. Fisher characterizes as a municipality's "primary obligation to secure."

And here we must realize the great shift of responsibility for the development of the industry that has come with the creation of public utility commissions.

Obligation Accepted by Gas Company

When character of service and price of gas were under its own control, a gas company, accepting a franchise, accepted an obligation to provide and maintain a plant adequate to the demand for the service it supplied in the community it served. Its obligation was to be made for the demand as it came, if reasonably foreseeable, and to get ready with dispatch for unforeseeable demands. The proper performance of these duties is a very serious matter. On it depends some measure of the welfare of millions of people, and the security of millions of invested savings of scores of thousands of people. Since the creation of public utility commissions, endowed with the sole power of control of rates and capitalization, the obligation of a gas company to be ready to supply gas to all in its territory willing to pay the cost of service is no longer unqualified. It is obvious that as the control of the character of service and price of gas have now been taken from the gas companies, the companies themselves cannot any longer create

the conditions necessary to insure such profits as will invite capital to the enterprise. The obligation to provide a plant adequate to the demands that may be made upon it is now conditioned upon the opportunity being insured the company to earn and divide among its stockholders such profits as shall make its securities a desirable investment in a competitive money market. This opportunity is now dependent on commission action. It is now therefore the duty of a commission to determine and order that combination of character of service and price of gas which will be so prophetic of profits as to command the capital necessary to enable gas companies to meet the demands upon them. In the view of the gas industry, and in view of Mr. Fisher's pronouncement, this is the great significance of the change from company to commission control.

Capital Must Be Induced—It Cannot Be Compelled

No man—present stockholder or other—is required or may be forced to provide the necessary capital—he must be persuaded. There is but one way to persuade him. It is to make the investment so attractive that capital will seek it. This is in the hands of the commission. The gas company has little to do with it beyond foreseeing the necessity and presenting its petitions and arguments to the commission. If the commission fails to order such price and conditions of service as will earn the dividends necessary to attract capital in a competitive money market, there will be no capital provided, and there will be no extension of service. There will be a shortage of a necessary service in the community, and the commission will have failed in its most important function. It remains the duty of gas companies to provide such service as is ordered with the least practicable expenditure of labor and material.

The timidity of capital has passed into proverb. In considering the course to be followed, to insure that capital will come to our undertaking, we must remember that men will not invest in an industry which is under a cloud, or with even a remote (if perceived) danger of entire or partial confiscation of property or of profits.

Industries are normally in competition for capital in the money markets of the world. Before capital will flow into a public utility, opportunity must be assured it to earn, without wastage of itself, at least such a measure of return as could be expected from any other use at the time offering. A gas company must have credit of this kind in the money markets of the world or it cannot secure the funds for the extensions that are necessary to maintain and extend the service as the demand for gas increases, and to realize economies as the art advances. A gas company can secure credit only through confidence in its future earning power. Since the most potent of the conditons essential to the earning power of the industry are under the commission's absolute control, the prospective investor, whose money is necessary to make and maintain the gas property as an "efficient instrument," will require before investing to know what the commission has done and is likely to do in the matter. If the investment appeals to him at all, the rate of interest that he will be willing to contemplate will bear some inverse proportion to the assurance of opportunity to earn the rate. Since the interest on the investment is a factor in the price of gas, the more secure the investment the lower the price of gas.

The combination of price and character of service established must give promise of sufficient gross income to cover all operating expenses, to provide a sinking fund to restore all parts as they wear out, and to retire any parts that become obsolete or inadequate (but, except in the case of limited term franchise companies, not to return any part of the investment to the investor), and leave enough net reasonably to insure ability to pay upon existing and proposed investment the rate of interest the money market at the moment demands from such investment. Failing this, there will be no new investment. This appears obvious.

Lack of Ability to Secure Capital the Great Menace to Good Service

If I appear to have unduly and with unnecessary iteration emphasized this thought, it is because I so realize that lack of ability to secure capital is the greatest danger to the ability of the gas industry to properly serve the public under commission regulation, and because I so much desire to persuade you that the first step toward what Mr. Fisher characterizes the unescapable "primary obligation" of the municipal government now can be met only by the commission—and by it only through the establishment and maintenance of such a combination of quality and price as will make and keep the business attractive to free money in a competitive market.

Clearly it is to the interest of public and of investor to prevent any avoidable element of risk, or gambling chance, entering the investment. It is to the general interest—certainly to the public interest—that the investing public should have such confidence in the security of the investment as not to require the hope of abnormal profits to induce it to buy gas shares for extensions of service. This confidence will be strongest and rate of interest and price of gas lowest where previous investment has had protection.

It is impossible to determine universally applicable, or even generally applicable, standards of price, quality of product and character of service best to be established—that combination which will give to the consumer the greatest benefit per dollar paid. The materials of manufacture available for use so differ in kind and cost throughout the country that standards of quality and price best suited for one State or city may be impracticable for another State or city, and costs of operation will vary with the volume of the business. But there are certain general principles governing these and other matters under commission control and applicable to all situations. These should have mention, and I shall make such brief reference to them as my time permits.

Permanence of tenure should be assured to gas companies. A company of limted life must provide from its earnings a fund to retire at the end of its life all investments made in its property less its prospective selling value, and this provision will correspondingly increase the cost of gas.

The selfish interest of each gas company should be enlisted in the effort for low rates and good service. The public interest in this extends beyond the class of gas consumers, for a low selling price means a low cost, and a low cost means the conservation of the human and material resources of the nation.

In the general interest there should be the establishment of such standards of quality and service as will permit the widest selection of materials and methods

of manufacture practicable for the locality and leave the broadest possible scope for the exercise of engineering skill. This will also tend to national conservation as well as to reduction of costs.

Character of product and quality of service should be established under penalties sufficiently heavy to insure compliance and systems of inspection under competent men should be established adequate to the detection of violations of established regulations.

Established Selling Prices

Established selling prices must be sufficient to permit such a margin of divisible profit as will insure further investment as needed in a competitive money market.

When a gas company seeks to raise new capital for additions or betterments to its plant, it should be compelled to show the necessity of the proposed expenditures, and that each dollar of new investment made and securities issued will add a dollar of value to the property. Uniform systems of accounting and reporting should be adopted.

Further than these things regulation should not go. These things having been established, it should be left for the company to work out its own salvation, and it will be found to the general good to encourage hope in the gas man's breast and to permit special effort and special efficiency to reap a special reward, as under the "sliding scale." It is by leaving with the corporation officials all the latitude consistent with the enforcement of regulations as to standards and rates—all possible initiative, all possible hope of coincidentally serving stockholders and public—that the best and ablest men will be attracted to the service and the lowest rates assured to the consumer.

The per cent of return necessary as an expectation to secure the investment of new dollars is the per cent that for equity and for the accomplishment of purpose must be allowed to be earned on the entire value of the property devoted to the public use; that is, the value in dollars with which the new dollars by their investment are merged.

An industry's credit is dependent in large part on the record of its financial past—on what return, what per cent of its value, it has been able and permitted to divide. This value then must have an important place in the commission's formula for the determination of the price to be charged for gas.

I wish I might discuss at length the various practiced and proposed methods of arriving at this value of existing properties as a step in the process of determining the cents per 1,000 cu. ft. necessary to include in the price of gas for return on capital; but though this is of the first importance, time forbids. It is of the first importance to the public because upon the justice of the determination will depend, on the one hand, the ability of the company concerned to raise money for extensions, and, on the other, the ability of consumers to obtain gas at the lowest possible cost.

No Man Can Dogmatize on Methods of Valuation

Though I am not given the time adequately to discuss these various methods of valuation, some of the factors are so important and so far from general agreement that I think I must present them, though at the risk of outwearing your patience.

After a commission has decided what rate per cent of profit is necessary to do justice to present investment and to insure future investment, its next step will be the determination of the amount upon which this rate is to be earned. This step is generally called the "valuation" of the property, and it must be taken as one of the preliminaries to the final step—fixing the price.

No man may dogmatize on methods of valuation—there have been too many intelligent differences of opinion to permit that. I give my thoughts on the question with full recognition of this truth.

If the problem concerned a company starting all new it would be simple. The commission would keep an account of the expenditures of money from whatever source derived, in construction, in the development of the business, or otherwise; of the value of the property acquired other than by purchase, if any; of all issuance of securities for service rendered or for property, and of the interest on each of these during the period of construction and during the period of development to the point of earning the predetermined rate of profit. The sum of these items, less such amount of interest as might be earned during the period of development, would be the value of the property upon which the predetermined rate of profit should be earned. In the majority of instances of companies of many years' operation this amount of actual and properly to be capitalized investment cannot be determined from the books. Even if the books disclose all capitalized expenditures, they will fail to reveal great numbers of expenditures, some on other than construction account, many on the lesser betterments and extensions made from the funds of the companies properly capital charges, but not capitalized on the books. Also there may have been expenditures not capital in character, but capitalized on the books where loose systems of accounting have prevailed. So in the majority of cases that will come before commissions the properly capitalizable investment cannot be had from the books of account. Under these circumstances the most practicable way of determining the amount upon which the determined rate of interest shall be earned is by inventory and by valuation of inventory, part by part. We are able to inventory and thus to value the physical property within a very small per cent of accuracy, and having this value for the physical property we may make additions thereto of other items that cost money or securities to provide and that add to the amount upon which interest must be earned, if investvestment in the property is to be attractive. Among these are working capital and going value, discussed below; banking charges, organization expenses, etc., and interest on each item of cost during the period of development to the point of profitable operation. The sum of these items is not the value of the property as this value will be when the price of gas and the resultant earnings are known, but it is a figure upon which reasonably to base the estimate of earnings necessary to do justice to the present owner, and to make the business attract the savings of others. The real estate we may value at once by comparison with similar properties similarly located. The structures may be inventoried and their cost determined. I think that we can arrive at the cost of structures to the company in no way better than by determination of cost to build—if with physical conditions, such as pavement, rock, grading, etc., as they existed at the time of construction. And I believe that the average prices prevailing over a period

of five years will come very near the average of the actual prices paid through the life of the property, as part by part it has been acquired or erected. This would certainly be very nearly true for any period of five years other than the immediate past, with its great advance in the cost of everything, and for which allowance must be made. I believe that this method of determining the figure for value of property in the formula whose solution is to give the price at which gas must be sold, will do justice to the consumer, to the present owner and will be satisfactory to the prospective investor. I do not know of any other method so promising.

There are instances in which franchises have a value for capitalization in the hands of their present owners. These are special cases, too various for general discussion.

I think it is important here to discuss briefly the oft-discussed questions of the effect on value of pavements and of accruing depreciation.

Pavements

Some courts of high authority, in what I think a rather vague effort to find a basis for a guess at value, have made lists of various compositions of items—so-called "relevant facts"—to be given consideration, though not necessarily to control, in determining the value of the property devoted to the public use. In these lists is included as a factor to be considered the expenditure necessary to build the plant as existing at the time of valuation. This is called "replacement cost."

The existence of pavement on the streets adds materially to the otherwise cost of replacing mains and services. Where this "replacement cost" is used as one of the "relevant facts" to be given consideration the cost of existing pavement must be included, if "replacement cost" is to have its full and proper influence with the other "relevant facts" on the final mental conception which the advocates of this method form of value. But, since pavements laid subsequent to the laying of mains now under them have added neither to the investment of the owner nor to life or capacity of the mains, I do not believe it is necessary to include the cost of such pavement in the amount upon which interest must be earned in order to do justice or to insure that confidence in the security of the investment which will result in further investment, as needed. I hold this view, though in some cases courts and commissions appear to have held otherwise. The added cost of operation due to the existence of pavement with the necessity of occasionally cutting it for repairs to piping and the interest on the cost of mains laid in temporarily unprofitable territory to keep ahead of paving operations, must appear in the formula for determining the selling price of gas.

"Accrued Appreciation"

Another much-disputed question is whether a plant valuation should take into account the so-called, and unfortunately so-called "accrued appreciation." As I see it, a commission properly insisting upon a plant being kept in condition to render 100 per cent service cannot consistently deduct from the value of the plant, as if new, any sum for "accrued appreciation." I hold this view, though in some cases courts and commissions have held otherwise.

"Accrued depreciation" must not be presented as indicating a run-down or deteriorated condition for efficiency or for service, for this would be to mislead. Rather it must be regarded as indicating an accruing and not yet matured obligation of the owner of the plant to renew the plant, part by part, when necessary to maintain its efficiency and service-rendering value.

The consuming public's account with the owner of a gas plant stands always properly chargeable with the cost of the plant as if new, because as time elapses between the date when the plant was new and the date it will become necessary to restore any part, the reduction in the period of its useful life, which will be occuring, is offset, coincidently and commensurately, by the accruing obligation of the owner to renew the part when its period of satisfactory service is past. He has this obligation accruing, and he has also, throughout the life of the plant, his full original investment. He cannot escape this obligation as maturing, which in a large plant for some one or more items of construction is a matter of almost daily occurrence, without impairing, and perhaps destroying, the utility and earning capacity of his entire plant. Nothing in the industry is more certain than the renewal of parts as they wear out. It may be that the owner has wisely set aside each year a certain part of his earnings against the date of renewal of the larger structures. But whether or not he has foreseen and provided for the time of renewal, it will come, and almost daily as it does come he has to provide the cost from other sources than additional capitalization. Therefore, if we deny to the owner the opportunity to earn interest on the full reproduction value of his plant, that is, its cost if new—his investment—we compel him to devote a part of his investment to the public use without compensation, and we insure that he and they who know of his experience will avoid thereafter any similar investment. He has, through the years, an investment equal to the reproduction cost of the plant. Through the years he gives to the public a service not inferior to that rendered by a plant entirely new; for the signal for renewal of a part is the immediately prospective inadequacy of the part to continue to give good service. To renew any part while it is still capable of giving good service would be a waste of money and involve an added cost to the consumer. Before making any further investment the owner will require assurance that his earnings through the years will be upon the full amount invested. In return the service given will be as if from a new plant in all other respects similar.

Restoration of Parts

The cost of current maintenance of the plant—of restoring parts as they wear out—is necessarily an operating charge and will appear in the cost of the gas. I believe that all courts and commissions that have considered this question agree in this.

In addition to the physical structures are certain items of cost of establishing an operating gas company properly to be capitalized and return a profit. Among them are working capital—a very tangible thing—and "going value," a so-called "intangible." The amount of each of these items of cost will vary with the extent of the operations of the company and somewhat with other local conditions. If they, or any items of value, are omitted or slighted in making up the total value of a plant, with a resulting total below the fair and reasonable, the rate per cent of return upon that total earned

and divided must be made correspondingly higher before new capital will be interested. Free capital will not move until satisfied that the value with which it is proposed to merge it is having full and fair consideration.

"Going value" is a particularly interesting subject for discussion, and I regret to leave it with such scant mention.

These briefly are my ideas on some of the items in the valuation of a gas property. There is much more to be said of them, and there are other items of importance in our general problem that must have your attention at some time. Among these, and of great importance, is the method of arriving at the probable cost to produce and deliver the gas. Again, I regret not to be able to discuss them all to a conclusion.

Special Consideration in War-time

So far this discussion of the duties of public utility commissions has comprehended only the conditions of normal times. It is important to consider the duty of State gas commissions to the public and to the gas industry as affected by the unprecedented conditions created by the great war. I believe we will agree that the was has provoked an immediate need for help to tide our industry over the financial rocks and shoals that threaten to cripple it in its hour of greatest usefulness to individual and to nation.

The current rates for gas were fixed under conditions of costs greatly different from the present. In most instances there now are not sufficient earnings for dividends, and in many instances the receipts are not sufficient for the payment of operating costs. Practically nowhere do the earnings support the credit necessary to enable operating companies to meet the demands for new construction or for the renewal of maturing obligations.

The slow and exact processes of commission regulation, entirely proper and to be desired by all concerned in time of peace, must be temporarily abandoned to meet the exigencies of war times. That such exigencies exist is one of the many unfortunate conditions created by the war, and it is a condition which must be recognized and rectified. It is an unusual condition and calls for unusual treatment. The logical remedy appears to be in line with precedents already established—the arbitrary fixing of rates and standards as a war measure by the war-making authority—the Federal Government. The power to declare and carry on war carries with it by implication the power to adopt the measures necessary for the successful prosecution of the war. One of the measures necessary for the successful prosecution of the war is the maintenance of necessary industries. The industry which we are discussing is essential to the development of the full power of the nation. It cannot be maintained without immediate and radical changes—in standards or rates, or both. It cannot be extended to meet the increased demands of war times without assistance.

Putting the Onus Onto the State Commissions

If the above be sound, this is a matter with which the Federal Government must concern itself. The present duty of State commissions appears to be to sympathetically aid the gas companies so far as may be in their efforts to serve the people as well as conditions permit in these months of difficulty, and to encourage and second the Federal Government in any action it may take toward maintaining or reestablishing the financial credit of the industry. But since public utility commissions are directly charged with the responsibility to the people to maintain and develop the industry, protecting the citizen in his right to a gas supply and the supplier in his right to a profit, they are not doing their full duty unless, in the absence of Federal action or pending Federal action, they take full care of these their charges.

It is probable that at this time no opportunity for investment that does not involve the patriotic motive, or offer a prospect of returns far greater than may be hoped from any public utility stock, will attract capital. It is improbable that free capital can be induced to investment in extensions to gas plants to meet conditions of demand that may cease with the war. Yet, for the certain success of the war, such extensions must be made. Also, if gas companies could, unassisted, raise the funds necessary, it is not just to require of them that they make extensions of plant that will cease to be profitable as soon as the war ends—and may so remain indefinitely. The discussion of this point is academic—for gas companies cannot raise money for such purposes. It is out of their power. The Government, Federal or State, must advance the money. It should be arranged on terms that insure that the gas company concerned ultimately shall repay the full value to it of the governmentally financed extensions.

The British gas companies, naturally having suffered greatly from the war-created conditions in the labor and materials markets, have sought relief in Parliament, and a Parliamentary committee has reported on the matter. The first paragraph of its report reads:

"That, with the view of maintaining in the public interest the stability of gas undertakings, some provisions should be made for the temporary modification of statutory requirements with regard to price and dividends in the case of gas undertakings whose financial circumstances have been injuriously affected by causes arising out of the war."

The military importance of maintaining the credit of public service industries in this time of war is recognized by Hon. John Skelton Williams, Comptroller of the Currency, who in his annual report to the Congress says:

"The corporations referred to supply light, heat, power and electric railway transportation for passengers and freight. They touch intimately the daily life of the people. . . . Now they are threatened with ruin. If they are allowed to sink into inefficiency, much of the most important work of the Government will be crippled and paralyzed.

". . . It is essential that forbearance and consideration be exercised by the State commissions and municipal authorities, and that the corporations also be permitted to make such additions to their charges for service as will keep in them the breath of solvency, protect their owners against unjust loss, and give them a basis of credit on which they may obtain the funds with which to meet the strain put on them by the Government's needs. The breaking down of these corporations would be a national calamity.

"Because of the gravity of the situation in this regard, I am moved to ask for it the careful attention of the Congress and the public. I am impressed with the importance of early consideration by the Congress of some measure to provide, directly or indirectly, for advance of funds on some conservation basis to such of these corporations as need help most urgently, so that they can give adequate service to the Government. The remedy would be unusual; but the times are unusual."

By Secretary McAdoo in a letter to the President:

"Our public service utilities are closely connected with and are an essential part of our preparations for and successful prosecution of the war, and the unfavorable tendencies which the accompanying papers reveal may most effectively be checked, wherever they may be found to exist, and the needed relief obtained, only by prompt action on the part of the respective local authorities.

"I earnestly hope that you may feel justified in expressing the conviction that the vital part which the public utilities companies represent in the life and war-making energy of the nation ought to receive fair and just recognition by State and local authorities."

By President Wilson in a letter to Secretary McAdoo:

"I fully share the views you express regarding the importance of the public utilities as a part of our national equipment, especially in war-time. It is essential that these utilities should be maintained at their maximum efficiency and that everything reasonably possible should be done with that end in view."

Since the above declarations of authority were written it has been announced from Washington that the Federal Government will not undertake the fixing of prices of public utility companies. On this subject, and referring particularly to trolley and lighting companies, Mr. Tumulty has recently written the Mayor of New Orleans in part as follows:

"The conditions under which such companies operate in different parts of the country vary by so wide a variation that no common rule, it would appear, or method of relief could be applied to them. And it is the President's judgment that it is imperatively necessary that local and State authorities should take the action necessary for immediate relief."

Therefore, the obligation of protecting the public service industries on this vital point and in this critical hour remains with the State commissions. Mr. Wilson and his aids have amply set out the necessity for action.

Disappointment as to War Finance Corporation

The public utility operators confidently expected that the recently formed War Finance Corporation would greatly aid them in overcoming their war-created difficulties of raising money for demanded extensions, but the construction of the language of the bill by the directors of the corporation and by the Attorney-General of the United States has disappointed this expectation. The War Finance Corporation is not able to lighten this portion of the load of responsibility now resting on public utility commissions.

The opportunity for helpful work toward Mr. Fisher's ideal in the office of public utilities commissioner can hardly be overstated, whether in time of war or in time of peace.

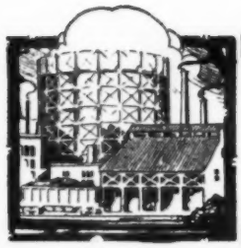
The old distrust and antagonism between gas companies and their customers, distressing to both, were born of misunderstandings. Some measure of misunderstanding is inevitable between the purveyor and purchaser of a commodity that is used as wanted —without coincident knowledge of the amount being used—and paid for as the use is indicated on a device of the purveyor, little understood and altogether unchecked by or for the customer. Such distrust and antagonism have greatly diminished in recent years, and must entirely disappear and mutual confidence and co-operation be established if under wisely administered commission rule, with its assurance of justice to seller and purchaser and its element of hope for all.

The dignity of the office of commissioner in control of an industry must be in proportion to the importance of the industry's part in the life of the people. A call to take on the duties of a public utility commissioner is a call to an obligation to protect, develop and regulate an industry vast and important to the citizen and to the State; it is a call to a position of great dignity and of the highest potential usefulness.

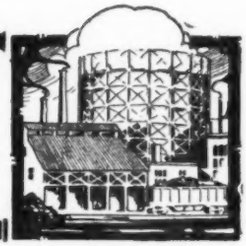
In the office of commissioner, bearing the delegated authority of the State—clothed with well-nigh sovereign powers over one of the greatest and most useful industries of modern days, with a large measure of the comfort and safety of millions of people, and the security of hundreds of millions of invested savings depending upon his judgment and good intent—in such a position any man, however great his attainments, however exalted his character, may find full opportunity for the exercise of his highest faculties and the satisfaction of his highest ambitions. It is a position of heavy responsibility to be desired only by men of clear and open minds who feel in themselves the power of self-sacrifice for a cause. Not even on the bench does character more become a man: and whatever we may say of aims to be attained, standards to be adopted, systems to be followed, now that gas companies are under commission rule, we must depend upon the character of the commissioners for escape from the usual deadening effect of the governmental hand on industry and for the success of the effort to make and maintain the public service corporations what Mr. Fisher nominates "effective instruments for the service of the individual citizen and the development of the organized community." There is no place on a public utility commission for a faddist or a demagogue.

W. B. Miser, manager of the Drumright division of the Oklahoma Gas & Electric Company, has received a commission as captain in the Engineer Corps of the United States Army, and will leave shortly for one of the cantonments.

Lieut. C. E. Norenberg, formerly of the engineering department of H. M. Byllesby & Company, Chicago, has been commissioned captain.



NEWS OF THE GAS INDUSTRY



Southern California Company Purchases Plant and Pipe Lines of Western Fuel Gas Company

The plant of the Western Fuel, Gas & Power Company at Hermosa Beach, Cal., together with pipe lines, franchises and rights of way in Hermosa, Manhattan and Redondo Beaches, was transferred to the Southern California Gas Company by a deed filed recently at the county recorder's office.

The sale was recently approved by the railroad commission, the purchase price being $145,000. The sale does not include the land on which the plant is situated. A three-year lease of the land to the Southern California Gas Company also was filed, the rental being $15 a month. The company is given the option of purchasing a portion of the property at the end of three years on the basis of $2,000 an acre.

Iroquois Company Must Supply Homes First

Order Dividing Consumers into Domestic and Industrial Groups

The public service commission has directed the Iroquois Natural Gas Company, of Buffalo, N. Y., to divide its customers into two grades, domestic and industrial. Beginning Dec. 1 and continuing until March 21, no natural gas may be furnished any industry without the consent of the commission. Domestic consumers are to include the users of natural gas for heating, lighting and cooking for private houses, boarding and apartment houses, and users of natural gas for lighting and cooking only in hotels, restaurants, bakeries, eating places, clubs, hospitals and charitable institutions.

The order will not affect industrial consumers engaged in war work for the United States, if the Government deems the use of gas necessary. It is believed this order will result in furnishing sufficient gas to the householders, who in past winters have suffered because of the shortage. A number of plants may be somewhat inconvenienced, but it is believed they will have ample time to make other arrangements to obtain substitutes.

The order provides for the installation of pressure gauges and a standard pressure of at least 4 ounces to the square inch, and that no domestic consumer shall be permitted to use gas in a furnace not originally constructed for the use of gas.

Columbia Gas Carries Many Times Fixed Charges

In the seven months' period to July 31 the Columbia Gas & Electric Company covered its fixed charges six and one-half times over and carried $6,188,602 to surplus. The surplus increase over the similar period for 1917 was about $150,000.

Receiver Asked for Wichita Oil and Gas Company

Action was brought recently in the District Court by State Attorney General Brewster to have a receiver appointed and an accounting taken of the resources and general financial condition of the Wichita (Kan.) Oil & Gas Company. The action was brought against the company, the directors and against each director individually.

About two years ago this company started a test for oil southwest of Wichita, near Schulte. A star rig was used, and when the company ran short of finances the depth was approximately 1,400 ft. The company announced last fall it would raise more money and drill a deep test with a standard rig. A few weeks ago it was said at the company's office that the directors were ready to let a drilling contract for the deep test near Schulte.

Increase Granted St. Louis County Company

Present Increase Lower than Originally Sought

By a vote of six to one the seven incorporated towns of St. Louis County last week agreed to permit the St. Louis County Gas Company to advance its rates from $1.15 per 1,000 cu. ft., with a 5 per cent discount for prompt payment, to a net price of $1.33 per 1,000 ft. The gas company in a recent petition to the Public Service Comission of Missouri asked for an increase that would have brought the rates for the domestic consumer to $1.50 per 1,000 cu. ft, with a 5 per cent discount for prompt payment. Manager L. N. Egan, of the company, however, accepted the compromise offer of the League of Municipalities, which was 9½ cents less than the increase sought.

The St. Louis County Gas Company serves the suburbs of St. Louis, including Maplewood, University City, Richmond Heights, Clayton, Kirkwood, Webster Groves and Ferguson. All but Maplewood voted in favor of the compromise with the gas company. Ferguson, Kirkwood and Webster Groves voted for the $1.33 rate, despite the fact that they have contracts with the gas company calling for a maximum rate of $1.30, with a 10 per cent discount. The compromise was decided on when officials of the gas company in a conference with representatives of the various municipalities convinced the city officials that unless a reasonable increase in rates was granted the company might be forced into a receivership.

The friendly relations between the gas company and its patrons in this case is demonstrated by the fact that although the agreement between the gas company and the League of Municipalities did not prevent private citizens from filing protests against the proposed increase in rates, no such protest has been filed.

The Seventh Annual Congress of The National Safety Council

Will Be Devoted to Accident Prevention and Allied Topics in the Light of War Conditions

The co-ordination of America's resources for the winning of the world war will take on added significance the week of Sept. 16 to 20, when the Seventh Annual Safety Congress of the National Safety Council convenes at the Hotel Statler, St. Louis, Mo.

A message emphasizing the pressing need for the conservation of man power will be received from President Woodrow Wilson, a member of the Cabinet delivering the principal address at a public meeting to be held the opening day of the convention. "Safety as an Asset in Winning the War," by the Hon. Franklin K. Lane, will express the views of our National Government in its determination to prevent every avoidable accident in industrial America. Charles M. Schwab, director of the Emergency Fleet Corporation, will give the principal address at the opening session of the convention, his subject being "The Democratization of Industry."

David Van Schaack, president of the National Safety Council, will call the congress to order Monday morning, Sept. 16, at 10 o'clock, awarding the place of honor to Mayor Henry W. Kiel, Mayor of St. Louis, who will formally welcome the delegates and visitors, and the first business session of the convention will occupy the remainder of the forenoon.

Mr. Schwab's address will occur immediately after the noon intermission, and he will be followed by John Ring, Jr., president of the Advertising Club of St. Louis, who will discuss the "Nationalization of the Safety Idea." "The Economic Value of Health of Industrial Employees," by Dr. Thomas Darlington, American Iron and Steel Institute, New York City, will be one of the noteworthy addresses at this session. As a closing feature one of the latest industrial safety films will be shown.

The third session of the day will take the form of a public mass meeting, and at this gathering the Secretary of the Interior will be the principal speaker. Patriotism will be given full opportunity for expression, and a military band and addresses by prominent safety exponents will complete a day of unusual activity.

Tuesday's program will open with a general session, arranged primarily for the benefit of safety engineers desiring to familiarize themselves with the fundamental principles and methods of securing success in their safety work. Charles R. Hook, vice-president, operating division, American Rolling Mill Company, will preside as chairman. The papers and their authors follow:

"The Real Poblem of the Safety Engineer," by Charles R. Hook, vice-president, operating division, American Rolling Mill Company, Middletown, Ohio; "How to Organize for Safety," by Frank E. Morris, safety engineer, American Rolling Mill Company, Middletown, Ohio; "Modern Methods of Safeguarding," by John J. Heelan, superintendent Bureau of Inspection and Accident Prevention, Aetna Life Insurance Company, Hartford, Conn., and "Does the Attitude of the Foreman Determine the Success of the Safety Engineer?" by W. E. Worth, general superintendent Chicago Tunnel Company, Chicago, Ill.

While the general session is progressing in the main meeting hall a special meeting of local council officers and committeemen, under the leadership of C. W. Price, field secretary of the National Safety Council, will take place in one of the smaller assembly rooms. Specialists in applying the national message to local needs will present scientific analysis of the work of the past year, as follows:

"The Western Pennsylvania Division Plan," by W. R. Rasmussen, permanent secretary Western Pennsylvania Division, Pittsburgh, Pa.; "The Ideal Local Council Program for Large-Sized Communities," by F. M. Rosseland, safety engineer, National Safety Council; "Successful Methods of Securing Attendance at Safety Meetings," by Marcus A. Dow, general safety agent, New York Central Lines, New York City; "How to Successfully Conduct Foremen's Meetings," by John W. Costley, chairman Tri-City Local Council, Granite City, Ill., and "Moving Picture Mass Meetings for Workmen," by E. B. Saunders, assistant field secretary, National Safety Council, Fitchburg, Mass.

Tuesday afternoon a general round-table discussion, under the direction of Chairman Phillip Stremmel, general superintendent Granite City Steel Works, will occupy the full time of the convention. Among the principal topics to be discussed will be "How to Get the Manager Interested in Safety" and "The Promotion of Community Interest in Safety as an Industrial Asset." This session will give full opportunity for discussion of various methods successfully tried by members of the council in maintaining continual progress in accident prevention and for the asking of questions and the exchanging of views. A dinner and entertainment will follow, under the direction of the mining and iron and steel sections.

Tuesday, Wednesday, Thursday and Friday will witness the inauguration of sectional meetings, where the delegates will gather to discuss problems of accident prevention peculiar to their calling or industry. Each sectional meeting will be followed by an experience meeting, and employers, safety committeemen and others will have full opportunity to tell their experiences in safety work or ask council and advice.

An informal dinner will be held Wednesday evening, Sept. 18, with W. B. Bilheimer, general manager Franklin Life Insurance Company, St. Louis, toastmaster. A novelty in the form of a five-minute address by President Woodrow Wilson, by long-distance telephone, through courtesy of South Western Bell Telephone Company, will be a leading feature of the occasion. The new director of the American Museum of Safety, R. M. Little, will speak on "Forethoughts and Afterthoughts on Safety," and a patriotic address will be made by James Schermerhorn, of Detroit, and "The New Place the War Has Given Women in Industry," by Jane Adams, Hull House, Chicago, Ill., will complete a most enjoyable evening.

A complete review of the program of sectional activities is impossible, but a preliminary view of the splendid treat in store for the delegates to the convention would be sadly lacking if we failed to quote from the first session of the Health and Industrial Relations Division, Health Service Sectional Meeting, to be held from 2 to 5 o'clock Tuesday afternoon:

I. "Health Work in the Small Plant," by Dr. Royal A. Shoudy, chief surgeon, Bethlehem Steel Company, South Bethlehem, Pa.; II. "Eliminating Unnecessary Time Lost by Injury," by C. W. Price, field secretary, National Safety Council, Chicago, Ill.—(a) Securing early reporting of accidents, (b) quick service, (c) follow up in homes, (d) follow up in factories —continuous medical attendance; III. "Eliminating Unnecessary Time Lost by Sickness," by Dr. Otto P. Geier, director Employees' Service Department, Cincinnati Milling Machine Company, Cincinnati, Ohio, and IV. "Team Work —Getting Doctors, Service Workers, Foremen and Workmen Together," by Dr. C. G. Farnum, chief surgeon, the Avery Company, Peoria, Ill.

The establishment of permanent salaried secretaries in a number of important cities and the drive for public safety inaugurated in the Rochester campaign, together with important additions to the council's headquarters staff, clearly indicate that the day of needless waste of the nation's greatest and most valued possession—her workers—is a thing of the past.

New Well at Elk City Good for 20,000,000 Ft. of Gas

A well on the Hett land, 4 miles northwest of Elk City, Kan., was drilled in recently. It is good for 20,000,000 ft. of gas, according to gauge test. This well is a little more than one-fourth of a mile east and 200 ft. north of the 30,000,000-ft. gas well on the Simmons farm, in the same section. The top of the sand was reached at 1,335 ft., and drilled into but a few feet. The casing has been anchored and no trouble is anticipated in shutting in the tremendous flow of gas.

Port Huron Official Appears Before Commission in Rate Case

B. J. Crahan, manager of the Port Huron (Mich.) Gas & Electric Company, appeared before the city commission recently and made a strong plea to have the commission grant the company the necessary permission to increase its gas rates. Mr. Crahan painted a dark picture of the future outlook of the company and stated that a recent ruling of the Government on fuel had added an additional deficit of 4 cents per 1,000 ft. of gas to the already large deficit in its manufacture. He stated that other cities in the State had been permitted to increase their rates. He asked for action in the next thirty days, and contended that the company would be up against it unless permitted to make a higher rate.

Midway Gas Company Gets Franchise From Los Angeles County

The California Railroad Commission has authorized the Midway Gas Company to operate under a franchise granted it by Los Angeles County, the company having stipulated that it will never claim before a public body a value for the franchise greater than $306.80, the amount paid for it.

Holland Gas Company in Receivers' Hands

The Holland (Mich.) Gas Company has been allowed to pass into the hands of receivers following a decision made by the American Public Utilities Company at its annual business meeting, held recently at Grand Rapids.

Los Angeles Company Seeks Higher Rate

Attorney Paul J. Overton, general counsel for the Los Angeles (Cal.) Gas & Electric Corporation, recently presented an application before the State railroad commission in San Francisco, asking for an increase in the rates charged for gas in Los Angeles. In the plea that the local corporation be granted permission to increase its rates, Attorney Overton said that his corporation is the last of the larger companies in that State to make such a request, and that it is based upon conditions produced by the war. He said the directors of the corporation have opposed any increase for the past year, even when the need for such a move was made manifest by the high cost of products necessary to the manufacture of gas.

When the railroad commission granted increases in the rate charged for gas in almost every other section of the State the local corporation in Los Angeles was forced to take action in order to meet competition, he said.

"Our corporation is the last of the big concerns to ask for an increase in gas rates," said Vice-president Charles A. Luckenbach. "This move has been taken after careful consideration of the conditions governing fuel, and is an absolute necessity. We had hoped that conditions might so frame themselves that such action would not be necessary, but we were forced to make the application at this time in order to meet the high cost of maintenance.

"The application is filed as a last expedient in order to keep ourselves on an equal basis with the high cost of operation. We have made this move with the full knowledge that the high cost of living is one of the serious conditions we all must face, and we have only asked for such an increase as will keep us a working corporation which is endeavoring to serve the public in the best possible manner."

City of St. Louis to Oppose Higher Rates Petitioned by Laclede Gas Light Company

That the city of St. Louis will oppose the efforts of the Laclede Gas Light Company to obtain an increase of about 23 per cent in its rates for gas service was the statement issued from the office of the city counsellor last week. The advanced schedule of rates has been suspended until Nov. 6, 1918, by the Public Service Commission of Missouri. George B. Evans, general manager of the Laclede company, however, has written the commission that a hearing be held at the earliest possible date.

Mr. Evans called the commission's attention to the fact that since filing the proposed schedule on July 10, the company has been compelled to increase its rates for labor at the gas manufacturing plants, and that this increase will cost the company thousands of dollars a year.

The announcement that the city would oppose the granting of an increase in gas rates was made by Associate City Counsellor Hamilton, the city counsellor being away on a vacation. No intention of protest, however, has yet been filed with the State commission by the city.

Rate Increase Petition Filed For Biddeford and Saco

The York County Power Company, conducting a gas service in Biddeford and Saco, Me., recently filed with the public utilities commission a revision of its schedule of gas rates, which, effective Sept. 14, 1918, proposes the following new rates: First 10,000 cu. ft. per month, $1.60 per 1,000 cu. ft.; next 10,000 cu. ft. per month, $1.50; balance cubic feet per month, $1.40 per 1,000 cu. ft.

The rates as now charged are as follows: First 3,000 cu. ft. per month, $1.60; next 3,000 cu. ft. per month, $1.40; next 4,000 cu. ft. per month, $1.30; next 10,000 cu. ft. per month, $1.20 per 1,000 cu. ft.

Maine Municipal Plant Filed Increased Schedule—Effective Sept. 1

The Municipal Light & Power Company, supplying gas to the city of South Portland, has filed with the Maine Public Utilities Commission a schedule of increased gas rates to become effective Sept. 13, 1918. The rates as proposed contemplate the following changes: An increase from $1.40 to $1.65 per 1,000 cu. ft. for the use of the first 2,000 cu. ft. or part thereof. From $1.30 to $1.50 for the next 2,000 ft. or part thereof. Also a sliding scale of increases for amount of gas used in excess of the first 4,000 cu. ft. The Westbrook Gas Company has also filed with the commission, effective Sept. 13, 1918, increased rates, the advances being in correspondence with those sought to be established by the Municipal Light & Power Company.

Northern Indiana Company Petitions For 15 Cent Advance

The Northern Indiana Gas & Electric Company has asked the State public service commission to allow an increase of 15 cents per 1,000. It is claimed by the company that this is absolutely necessary by reason of the increased cost of material necessary in the manufacture of gas. According to the company's statement there has been an increase in the cost of coal, oil and labor which amounts to practically 75 per cent of the entire outlay in costs of production.

Higher Rate Asked By Central Indiana Company

Higher gas rates for the larger class of consumers in Anderson, Elwood and Alexandria are asked in a petition filed with the public service commission by the Central Indiana Gas Company, of Muncie, Ind. The company wishes to raise the rates on all gas used in excess of 5,000 cu. ft. a month. Present net prices are 90 cents for the first 1,000 ft., 75 cents for the next 4,000 ft., 50 cents for the next 95,000 ft., and 40 cents for all over 100,000 ft. The proposed change will not interfere with the average consumer, but all who use in excess of 5,000 cu. ft. will have to pay 75 cents under the new schedule.

Personal Notes

W. S. Maxson, who has been connected for about three years with the sales department of the Sacramento Gas Company, has resigned to take a position with the sales corporation in San Francisco. He was identified prominently with Chamber of Commerce activities.

A. P. Smythe, for the past sixteen years connected with the Princeton (Ill.) Gas Company, a greater part of which he has been superintendent, has severed his connection with that company, to take effect the middle of September. Mr. Smythe goes to Aurora, where he has accepted a position with the Barber & Green Manufacturing Company, a belt conveyor manufacturing concern. His successor has not yet been announced.

J. A. Schabeck, formerly assistant superintendent of Division "O" of the Public Service Company of Northern Illinois, has been appointed superintendent of Division "L," in place of G. E. Chapman, who has resigned. The change took place Aug. 15.

Arthur W Piper has been appointed office manager and accountant by the Newburyport (Mass.) Gas & Electric Company to take the place made vacant by the resignation of Frank C. Kidder, who has been appointed to a Government position. Mr. Piper assumed his new duties Sept. 1.

J. Carroll Aaron, commercial agent of the Peoples Gas Light Company, Manchester, N. H., will become acting executive secretary of the Manchester Board of Commerce on the departure of William A. Searle.

Donald Sands, of Great Plain district, has taken a position with the Danbury (Conn.) & Bethel Gas & Electric Light Company.

Eugene R. Rowell, president of the Plymouth (Mass.) Gas Light Company, died recently. He was sixty-one years old.

Victor F. Dewey, formerly vice-president and general manager of the Detroit City (Mich.) Gas Company, has been appointed general manager of the Detroit Steel Products Company.

C. A. Zeilman has resigned his position with the Public Service Gas Company at Englewood, N. J., and accepted a position as head cashier with the Hackensack Water Company at Weehawken. Mr. Zeilman has been with the Public Service Company just eight years.

Construction Notes

Sheridan Gas Plant Not to Be Junked

Will Enlarge Plant at an Expenditure of $40,000

The Sheridan (Wyo.) gas plant, which was to be junked on Sept. 1, in accordance with plans formulated early in the summer by Sweet, Causey, Foster & Company, Denver brokers, who control the gas company, will remain in operation.

A campaign will be immediately inaugurated for enlarging the plant—a campaign which will involve the expenditure of $40,000 during the coming twelve months and the laying of many miles of new gas mains.

Definite assurance to this effect is given in a letter received Aug. 30 by the Sheridan Commercial Club from Sweet, Causey, Foster & Company, as well as in statements by Fred W. Freese, general manger of the gas plant, who has returned from Denver after a conference with officials of the Denver bonding company.

Efforts quietly made by rep-

resentatives of the Commercial Club to ascertain means of placing the gas plant on a paying basis in Sheridan are declared to be responsible for the change in attitude of the Denver owners, who had taken practically all steps necessary to appeal to the Wyoming Public Utility Commission at Cheyenne for permission to junk the plant on the ground that it was losing $700 to $800 a month.

Commercial Club representatives recently made an extensive investigation, and as the result of this study filed a report to the Denver company to the effect that it was the opinion of the organization that the gas plant could be placed on a paying basis if more money were expended by the company to extend the patronage of the plant. The Commercial Club further volunteered its services to the company in aiding in a vigorous campaign for new patrons.

This offer was accepted, and the campaign for new patrons will be inaugurated at once.

Details of the plans for the improvement of the plant will be announced shortly.

Model Gas Plant For Bath Expected to Be Ready by the Middle of October

Will Have Capacity for City of About 75,000 Population

Rapid progress is being made upon the new gas plant of the Bath (Me.) & Brunswick Light & Power Company. Improvements and new construction are under the supervision of W. L. Robertson, of Waterville, superintending engineer of the Central Maine Power Company.

The old building of the Bath & Brunswick Light & Power Company has been razed and a two-story brick building will be completed shortly. The building from the ground to the eaves stands 23 ft., and is about 30 by 40 ft. in dimensions. It will have concrete trimmings and a concrete floor. The old structure was sixty years old.

The new building will take care of the generator and two condensers and appurtenances. It is a water gas plant, and the old meter will be removed and an Ingersoll compressor installed.

The new water gas set, the generator, has a superheater connected, and also dries and mixes the gas. There will be a new modern boiler to operate the compressor and heat the buildings.

Three large tanks now on the site have a capacity of 10,000 cu. ft. each, and will be set on end on concrete piers. Each of the compressor tanks weigh 10 tons and is 8 ft. in diameter and 36 ft. in height. They are tested to a pressure of 100 lb. to the square inch.

The new plant will turn out 200,000 cu. ft. of gas in twenty-four hours, and these figures do not represent its full capacity. It could provide an ample supply of gas for a city five times the size of Bath.

Most of the new machinery and apparatus is coming along in good shape. Some of it is now on the ground.

Adjoining the building is the large coal shed, approximately 200 ft. long by 75 ft. in width, and in this are now stored nearly half its capacity of coal.

The new building will have six large doors and twenty-four windows, so that there will be plenty of light and good ventilation, which the gas makers will appreciate after the years of broiling and blinking in the old structure. The four front doors are so arranged as to take in new machinery and coal conveniently and the architectural appearance will be neat. It faces the south.

There will be no coke and only a thin sheet of tar in the new process, but the gas will be made at a saving of 50 per cent over the former process of manufacture.

Each 1,000 ft. of gas will be manufactured by the use of 50 lb. of hard coal and 3 gal. of oil.

To a large extent the present plant, that is, the old structure, will be remodeled and kept ready for emergencies that may arise.

The new plant will be in operation about the middle of October.

Municipal Gas Plant Discussed For Buffalo

Establishment of a municipal gas plant and the fairness of the new gas rates established by W. J. Judge, owner of the Buffalo (N. Y.) Gas Company, were discussed at a conference in the office of Commissioner Kreinheder, of the department of public works.

The communication sent to the council before adjournment by Corporation Counsel Rann, in which he recommended that study be given the question of starting a municipal gas plant, was gone over. Estimates of the cost of such an enterprise were discussed, and what would be a reasonable rate for manufactured gas in Buffalo, in view of advanced prices, was another matter talked over.

American Locomotive Company Planning to Erect a Large Plant

Exact Location Not Decided Upon—Will Probably Be a Great Gas Consumer

Announcement has been made by the St. Louis Chamber of Commerce that the American Locomotive Company, of New York City, will build a $13,000,000 plant in the St. Louis industrial district if the War Industries Board will issue a permit for the plant. At the same time it was said at the chamber that unconfirmed reports from Washington are to to the effect that the War Industries Board has issued the necessary permit.

In view of the growing use of gas for industrial purposes, especially in railroad car construction, it is probable that the new locomotive plant will become one of the biggest, if not the biggest, gas consumer in the St. Louis district.

The exact location of the plant has not yet been decided upon. It is understood the plant will cover between 200 and 300 acres of land. The company is considering two propositions as to specific location, one that it locate on the west side of the Mississippi River, because of the more desireable housing facilities available for its employees at St. Louis, the other that it locate on the east side of the river, in Illinois, so as to be near the steel mills, from which it plans to obtain much of its raw material.

The various gas companies in the vicinity are awaiting the decision as to the location of the plant with great interest. It is reported the plant wil employ 6,000 men, and will have a capacity of forty complete locomotives a week.

City to Protest Withdrawal of Logan Company From Sandusky

The Logan Natural Gas & Fuel Company served notice on the city of Sandusky, Ohio, that when its present contract expires, July 9, 1919, it will withdraw from Sandusky. The contention of the city is that it has no right to withdraw.